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A
DICTIONARY
OF
PRACTICAL MEDICINE

A
DICTIONARY
OF
PRACTICAL MEDICINE
BY VARIOUS WRITERS

EDITED BY

JAMES KINGSTON FOWLER, M.A., M.D.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS; SENIOR ASSISTANT PHYSICIAN
TO THE MIDDLESEX HOSPITAL, AND LECTURER ON PATHOLOGICAL ANATOMY
IN THE MEDICAL SCHOOL; SENIOR ASSISTANT PHYSICIAN TO THE
HOSPITAL FOR CONSUMPTION AND DISEASES OF
THE CHEST, BROMPTON

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P R E F A C E.

IN this work an attempt has been made to present in a somewhat concise form an account of the more important subjects comprised under the head of Practical Medicine, including also the Diseases Peculiar to Women.

In the selection of the subjects and the order of description, practical utility has been considered rather than completeness of detail, in the belief that such a work will probably be more often referred to with some immediate object in view than used for systematic reading.

All subjects properly belonging to Surgery have been excluded, but in some of the articles dealing with the Diseases of Women it has been necessary to give the details of the surgical procedures recommended.

Owing partly to the number of synonyms in common use, there is room for much divergence of view as to the most suitable headings under which to arrange the many subjects included in a Dictionary of Medicine. The rule here followed has been to place each description where it will most probably be looked for, and only in exceptional cases to group all the affections of an organ into one article—as, for example, “Spleen, Diseases of.”

For the reason already stated, and for facility of reference, the various sub-headings into which the description of a disease is usually divided are given in an order differing somewhat from that usually adopted, an account of the Symptoms, Course, Diagnosis, and Prognosis preceding that of the Pathology, Morbid Anatomy, and *Ætiology*. Each article concludes with the Treatment of the disease, and in order to avoid as far as possible a reproach frequently expressed, that on that subject comparatively little help is to be obtained from works on Medicine, the exact doses and combinations of the various drugs recommended

have in most cases been given, and it is hoped that this may add to the usefulness of the book to the practitioner.

A General Index, including a list of the articles, with cross-references, will be found at the beginning of the Dictionary.

The greater number of the unsigned articles are by Dr. John Abercrombie and the Editor.

The Editor desires to tender his thanks to all the contributors for their invaluable aid, and to many friends for most useful suggestions and advice.

LONDON, *July* 1890.

LIST OF CONTRIBUTORS.

ABERCROMBIE, JOHN, M.D., F.R.C.P.

Physician to Charing Cross Hospital, and Lecturer on Forensic Medicine ;
Assistant Physician, Hospital for Sick Children, Great Ormond Street.

ACLAND, THEODORE DYKE, M.D., F.R.C.P.

Assistant Physician to St. Thomas's Hospital ; Assistant Physician to the
Hospital for Consumption and Diseases of the Chest, Brompton.

BEALE, E. CLIFFORD, M.A., M.B., F.R.C.P.

Physician to the City of London Hospital for Diseases of the Chest, and to
the Great Northern Central Hospital.

BEEVOR, CHARLES EDWARD, M.D., F.R.C.P.

Physician to the National Hospital for the Paralysed and Epileptic ; Physician,
National Orthopædic Hospital ; Physician for Out-Patients, Great Northern
Central Hospital.

BURNET, ROBERT WILLIAM, M.D., M.R.C.P.

Physician to the Great Northern Central Hospital.

CARTER, WILLIAM, M.D., F.R.C.P.

Honorary Physician, Liverpool Royal Southern Hospital ; Professor of Materia
Medica, University College, Liverpool ; Consulting Physician, Liverpool
Eye and Ear Infirmary.

CAYLEY, WILLIAM, M.D., F.R.C.P.

Physician to the Middlesex Hospital and Lecturer on Medicine ; Physician to
the London Fever Hospital ; Consulting Physician to the North-Eastern
Hospital for Children.

COUPLAND, SIDNEY, M.D., F.R.C.P.

Physician to the Middlesex Hospital and Lecturer on Practical Medicine.

CROOKSHANK, EDGAR MARCH, M.B.

Professor of Bacteriology, King's College, London.

FINLAY, DAVID W., M.D., F.R.C.P.

Physician to the Middlesex Hospital and Lecturer on Forensic Medicine and
Public Health ; Physician to the Royal Hospital for Diseases of the Chest ;
Physician to the Scottish Hospital.

FOWLER, JAMES KINGSTON, M.A., M.D., F.R.C.P.

Senior Assistant Physician to the Middlesex Hospital, and Lecturer on Pathological Anatomy; Senior Assistant Physician to the Hospital for Consumption and Diseases of the Chest, Brompton.

FOX, THOMAS COLCOTT, M.B., M.R.C.P.

Physician for Diseases of the Skin, Westminster Hospital; Physician to Out-patients, Victoria Hospital for Children.

GAY, WILLIAM, M.D.

Late Clinical Assistant, Royal London Ophthalmic Hospital, Moorfields, and at the National Hospital for the Paralysed and Epileptic.

HADDEN, WALTER BAUGH, M.D., F.R.C.P.

Assistant Physician and Demonstrator of Morbid Anatomy to St. Thomas's Hospital; Assistant Physician to the Hospital for Sick Children, Great Ormond Street.

HALL, FRANCIS DE HAVILLAND, M.D., F.R.C.P.

Physician to Out-patients and in charge of Throat Department, Westminster Hospital, and Lecturer on Forensic Medicine; Physician to St. Mark's Hospital.

HERMAN, GEORGE ERNEST, M.B., F.R.C.P.

Obstetric Physician to the London Hospital and Lecturer on Midwifery.

HIME, THOMAS WHITESIDE, M.B.

Honorary Medical Officer, Sheffield Hospital for Women; Medical Officer of Health for Bradford, Yorkshire.

HOPWOOD, EDGAR OSWALD, M.D., B.A.

Resident Medical Officer to the London Fever Hospital.

HORSLEY, VICTOR, F.R.S., F.R.C.S., M.B., B.S.

Professor of Pathology, University College, London; Professor Superintendent of the Brown Institution; Assistant Surgeon to University College Hospital; Surgeon to the National Hospital for the Paralysed and Epileptic.

HUDSON, CHARLES E. L. B., F.R.C.S.

Warden of the Middlesex Hospital College and Surgical Registrar to the Hospital.

KIDD, PERCY, M.A., M.D., F.R.C.P.

Assistant Physician to the London Hospital; Assistant Physician and Pathologist to the Hospital for Consumption and Diseases of the Chest, Brompton.

LANG, WILLIAM, F.R.C.S.

Ophthalmic Surgeon to the Middlesex Hospital and Lecturer on Ophthalmic Surgery; Surgeon to the Royal London Ophthalmic Hospital, Moorfields.

LUFF, ARTHUR PEARSON, M.B., B.Sc.

Assistant Physician to St. Mary's Hospital, and Lecturer on Medical Jurisprudence and Toxicology; Assistant Physician to the North-West London Hospital.

MAC ALISTER DONALD, M.A., M.D., F.R.C.P.

Physician to Addenbrooke's Hospital, Cambridge; Member of the General Medical Council.

MAGUIRE, ROBERT, M.D., F.R.C.P.

Physician to Out-patients, St. Mary's Hospital, and Joint Lecturer on Pathology; Assistant Physician to the Hospital for Consumption and Diseases of the Chest, Brompton.

MONEY, ANGEL, M.D., F.R.C.P.

Assistant Physician to University College Hospital, and Assistant Professor of Clinical Medicine; Assistant Physician to the Hospital for Sick Children, Great Ormond Street.

MOTT, FREDK. WALKER, M.D., M.R.C.P.

Assistant Physician to Charing Cross Hospital, and Lecturer on Physiology.

MURRAY, HERBERT MONTAGUE, M.D., M.R.C.P.

Physician to the Foundling Hospital; Assistant Physician and Physician in charge of the Electrical Department, Charing Cross Hospital, Lecturer on Pathology and Morbid Anatomy, and Joint Lecturer on Practical Medicine.

MYERS, ARTHUR THOS., M.A., M.D., M.R.C.P.

Physician to the Belgrave Hospital for Children.

OWEN, ISAMBARD, M.A., M.D., F.R.C.P.

Assistant Physician to St. George's Hospital, Lecturer on Medical Jurisprudence.

PASTEUR, WILLIAM, M.D., M.R.C.P.

Assistant Physician to the Middlesex Hospital; Physician to the North-Eastern Hospital for Children.

PENROSE, FRANCIS GEORGE, M.D., M.R.C.P.

Assistant Physician to St. George's Hospital.

PRINGLE, JOHN JAMES, M.B., M.R.C.P.

Assistant Physician and Physician to the Skin Department, Middlesex Hospital.

REVINGTON, GEORGE THOS., M.A., M.D.

Assistant Medical Officer, County Asylum, Prestwich, Manchester.

SAUNDBY, ROBERT, M.D., F.R.C.P.

Physician to the Birmingham General Hospital; Consulting Physician to the Birmingham Eye Hospital, and to the Hospital for Women.

SHELLY, CHARLES EDWD., M.A., M.D.

Hon. Med. Officer to the Hertford General Infirmary; Medical Officer to Haileybury College.

SMITH, R. PERCY, M.D., F.R.C.P.

Resident Physician and Medical Superintendent, Bethlem Royal Hospital.

STEAVENSON, WM. EDWARD, M.D., M.R.C.P.

In charge of the Electrical Department, St. Bartholomew's Hospital; Physician to the Alexandra Hospital for Children, and Grosvenor Hospital for Women and Children; Physician for Diseases of Women and Children, St. George's and St. James's Dispensary.

SUTTON, J. BLAND, F.R.C.S.

Assistant Surgeon to the Middlesex Hospital, Lecturer on Comparative Anatomy, and Senior Demonstrator of Anatomy; Sir Erasmus Wilson Lecturer, and late Hunterian Professor, R.C.S. England.

WHITE, WM. HALE, M.D., F.R.C.P.

Physician to Guy's Hospital and Lecturer on Materia Medica and Therapeutics.

WIGLESWORTH, JOSEPH, M.D.

Assistant Medical Officer, County Asylum, Rainhill, Lancashire.

WILLIAMS, DAWSON, M.D., M.R.C.P.

Assistant Physician to the East London Hospital for Children.

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A

DICTIONARY

OF

PRACTICAL MEDICINE.

A

ABDOMINAL TUMOURS, Diagnosis of.—In the clinical sense, the term “abdominal tumour” is of very wide significance. It comprises any condition that causes general or partial enlargement of the belly, and is by no means limited to the class of new growths or cysts. The diagnosis, then, of the nature of an abdominal swelling, intumescence, or tumour embraces a large number of questions. It is, moreover, often a matter of difficulty to make such diagnosis by the methods of physical examination available. So great is this difficulty that it has even been said that nothing short of actual inspection after opening the abdominal cavity can lead to a correct diagnosis—a statement certainly true of many cases, but not of all. The main difficulties encountered in these cases by the clinical observer are due to the following circumstances:—(1) The great variation in the form and size of the abdomen in normal conditions. (2) Thickness of abdominal walls from excessive accumulation of subcutaneous fat, and rigidity of the wall from contraction of its muscles. (3) The simulation of true tumours by transient states known as “phantom” tumours. (4) The close proximity of some of the organs to one another, and the variable limits of the hollow viscera, rendering it difficult to localize the tumour. (5) The fact already mentioned of the very great variety of conditions that on abdominal inspection, palpation and percussion, yield the signs of a tumour.

There are at least two ways of dealing with this wide subject. We may either discuss *seriatim* the various abnormal swellings according to their nature and origin, or we may take a more clinical view and deal in turn with swellings of the whole of the abdomen, and then of those of its separate regions. The plan here pursued will be mainly the anatomical one; but, of course, reference will be made to the regional classification. Moreover, although it might be more scientific to group the conditions according to their pathological affinities, it is obvious that plan would involve much repetition, and might not serve the object in view—viz., the differential diagnosis in the living subject. We shall therefore speak in turn of conditions coming under the head of abdominal tumour as arising in connection with (1) the abdominal parietes, (2) the peritoneum and sub-peritoneal tissue, (3) the several abdominal and pelvic viscera, (4) the pelvic bones, and add a few words concerning (5) abdominal aneurysm and (6) phantom tumours. For fuller details of any of these morbid conditions reference must be made to articles specially dealing with them.

I. Tumours, &c., arising in the Abdominal Wall.—These often closely simulate tumours lodged within the abdominal cavity. We may mention among these swellings those produced by extravasation of blood beneath the skin, or between the muscles, or within the sheath of the rectus. Such a *hematoma*

may arise from an injury to the belly, as a blow or sudden violent strain, causing rupture of muscle fibres; or from the spontaneous rupture of a muscle, preferably the rectus, which has undergone Zenker's degeneration. This peculiar form of degeneration is liable to occur in cases of continued or high fever. It is not uncommon in typhoid fever, and the writer has known an instance of rupture of both recti, during acute pneumonia, from the patient leaping out of bed in a fit of delirium. The muscular fibres are rendered extremely brittle by this change, and hence readily give way if the muscle be forcibly contracted. The occurrence of this lesion and the resulting hæmorrhage may not be suspected during life, but occasionally it is declared by the appearance of a firm, defined, and tender swelling in the abdominal wall, on one or other side of the middle line, and generally below the umbilicus. There is mostly no discoloration of skin, the effusion being confined within the dense fascial sheath. If the case do not end fatally from the fever, the swelling will be observed to become softer, and will probably suppurate. In other cases there may be a history of injury to aid in diagnosis. Blood may also be effused into the abdominal parietes by the rupture of an abdominal aneurysm when this takes place posteriorly and allows of the gradual escape of blood into the tissues. In such a case of "diffuse aneurysm" there may appear a swelling in the flank which will gradually extend forwards, and, both to palpation and percussion, give the signs of a tumour. Should the hæmorrhage cease, the anterior margin of the swelling will become more defined, whilst here and there its surface may become soft and fluctuating. The appearance of such a tumour may precede by some days the final rupture.

In connection with this subject of *infiltrations* in the abdominal wall may be mentioned a condition not infrequently met with in cases of tubercular peritonitis in children. This is a peculiar induration, confined to various parts of the wall, which, on palpation, feels hard and rigid, suggestive of contracted muscles. But the hardness remains when the muscles are relaxed by an anæsthetic. The condition cannot be mistaken for scleroderma, for the induration is obviously deeper than the skin. It is possibly due to some inflammatory effusion into the subperitoneal or other tissues of the abdominal wall; it may indeed gradually disappear, as in a case known to the writer, where

the area of induration at first corresponded with that of the external oblique muscle.

Abscesses may arise in the abdominal wall from causes similar to those producing hæmatomata. Thus, one of the commonest is as a sequel of rupture or inflammation of a muscle due to violent and sudden effort or strain; and here again the rectus is the muscle most commonly involved. Or a violent blow on the surface may lead to localized inflammation and suppuration. As distinguished from such primary abscesses, the parietes may be invaded by the extension to the surface of deeply seated abscesses connected with caries of spine, rib, or pelvic bones, or from inflammation around the cæcum, kidney, gall-bladder, or other viscus (*e.g.*, fæcal abscess), or as the result of pelvic cellulitis, &c. In all cases of abscess in the wall its possible origin in deeper parts must therefore be borne in mind. It is not always easy to determine that an abscess is limited to the wall, especially as it is often beneath the superficial fascia or muscles. Such an abscess forms generally a smooth, rounded swelling, elastic, mostly tender, frequently painful, although if it be quiescent this latter symptom may be absent. Fluctuation can generally, but not invariably, be obtained. If the abscess be extending, then, besides hectic and other signs of active suppuration, there will probably be some redness and œdema of skin over the swelling. In every doubtful case the abdomen should be carefully palpated under chloroform, no more forcible manipulation being used than if the patient were not anæsthetized. The diagnosis may only be reached by a process of exclusion, for such an abscess has been mistaken for hydatid, or intussusception, even for aneurysm when seated over the aorta or an iliac artery, the pulsation of the vessel being transmitted through the abscess. In the last-named case it is well to palpate the swelling when the patient is in the knee-elbow posture, when the pulsation will be found to cease. To distinguish it from a solid tumour in the wall it may be necessary to make an exploratory puncture with a grooved needle or the aspirator. The fact that the abscess contains gas does not necessarily mean that it is directly or indirectly connected with stomach or bowel, for there is no doubt that the contents of a deep-seated abscess in the wall, in contact with intestines, may putrefy. It is needless to point out the risk of leaving an abscess in this

situation unopened—viz., the liability to rupture into the peritoneal cavity.

Cases of *simple cyst* in the abdominal wall have been described, and require mention, although the condition is a very rare one. It is analogous to the congenital cystic hygromata occasionally met with in the neck and elsewhere. Such cysts may attain a large size, as in one mentioned by Mr. T. Smith in the course of a discussion at the Clinical Society in 1880. It was the case of a child, whose belly was so distended and round that it "looked like a large gooseberry," and as the child was in such good health Mr. Smith postponed operation; but no surgical interference was needed, for one day after dinner the boy, in falling off a high chair, "burst himself," and forthwith the large fluctuating swelling entirely disappeared. A somewhat similar case was in the Middlesex Hospital in 1874. A boy aged six years presented a fluctuating swelling in the epigastrium, which, on aspiration, yielded some ochrey fluid. In a few months the fluid re-accumulated, and was again withdrawn. The aspiration had to be once more repeated, but all further need for evacuation was obviated by the boy falling down when running in the garden, and presumably rupturing the cyst, which ceased from that time to be evident. The cyst in this case was probably of hæmorrhagic origin, from the character of the fluid, and the history of a fall from a height two years before preceding the appearance of the swelling.

Besides the forms of new growth arising in the skin or subcutaneous tissue (*molluscum fibrosum*, *lipoma*, etc.) the abdominal wall may be the seat of *tumours* starting from the fasciæ or embedded in the substance of the muscles. Here again the rectus and its sheath are the structures most frequently involved. *Gummata* may occur in the muscle; *fibromata*, *myxomata*, or *sarcomata* in the fascia. The discussion of the several characters of such tumours does not come within the scope of this work; they are dealt with in surgical treatises. But such cases are of interest from the manner in which they simulate tumours within the abdominal cavity. The points to be noted in differentiating them are the following:—(1) The relation of the tumour to the abdominal muscles as determined by causing the patient to contract the muscle, and observing whether the tumour becomes more or less apparent during the contraction. Of course, if the growth in the wall be

beneath the muscle, it will be concealed by the contracted muscle, and the test is therefore not absolutely certain to exclude an intra-abdominal growth. (2) By palpation when the patient is on his hands and knees the parietal growth becomes more easily felt and its freedom from deep connections may be ascertained. (3) In many cases examination has to be made under chloroform.

II. Tumours, &c., connected with the Peritoneum and Sub-peritoneal Tissues.—There are many conditions, inflammatory and neoplastic, involving the peritoneum or its subjacent connective tissue, which fall under the head of abdominal tumours. But inasmuch as the serous sac lines the whole of the cavity, there are also certain of its lesions which produce a general enlargement of the abdomen. Such conditions are those in which there is effusion of fluid or gas into the peritoneal sac, and they may be first briefly referred to.

Under the general term *ascites*, it is usual to include all serous effusions into the peritoneum, dropsical or inflammatory. The former occur in cases of obstructed portal circulation, as in cirrhosis of the liver, or as part of a general cardiac dropsy, or of renal dropsy; the latter are met with in some cases of chronic peritonitis, and especially in tubercular or malignant disease of the peritoneum, the effusion in some of the latter cases being perhaps partly due to pressure on the portal vein by enlarged glands. There is seldom much difficulty in the diagnosis of ascites, except where the effusion is scanty or is contained in loculi formed by adhesions at various points. In a well-marked case the belly is uniformly enlarged, the flanks full, there is free fluctuation to be obtained across the abdomen, and, on percussion, there is dulness in each flank and over the lower half or more of the anterior wall when the patient is in the recumbent position, the dulness shifting with the position of the body. In cases when the intestines are distended with flatus and fluid feces, this shifting dulness may be obtained without there being any fluid in the peritoneal sac; but the writer only knows of two cases of this kind, and it may be safely said that the sign of shifting dulness is almost pathognomonic of ascites. It is less easy to be certain of the peritoneal origin of a loculated or encysted collection of fluid, since, in that case, the flank may be resonant and the area of dulness may not alter with the position of the body.

The condition most likely to be mistaken for ascites is a large unilocular ovarian cyst (ovarian dropsy). The shape of the abdomen, the resonant note in the flanks, and the history of the case will aid in the differentiation (*vide infra*).

In cases of perforation of the stomach or intestine the belly may become distended by the escape of *gas* into the peritoneum. This may almost invariably be distinguished from tympanites due to extreme flatulent distension of the intestines by the *entire* disappearance of the hepatic dulness caused by the gas collecting between the liver and parietes. It is sometimes of great importance, with regard to treatment, to determine the fact of perforation, and this sign may be fully relied on.

TUBERCULAR DISEASE OF THE PERITONEUM is characterized, so far as abdominal examination goes, by various signs. In many cases there is nothing to be made out on palpation. There is generally some fluid effusion, sometimes in considerable amount, but, owing to matting of intestines, the fluid may be collected in different places, and thus the characteristic signs of ascites may not be present. However, in several cases there is typical ascites. The matting together of the intestines is often indicated in the emaciated subjects of this affection by the detection on palpation of irregular, but resonant, tumours in various parts, or by the occurrence of ridges and masses of irregular shape, especially in the umbilical region, when the omentum is infiltrated. The presence of such tumours aids the diagnosis, but more value attaches to collateral evidence—*e.g.*, the age of the patient, family predisposition to tubercle, remittent pyrexia, pain and tenderness in the abdomen, diarrhoea (often absent), and in many cases (but by no means in all) the concomitance of signs of pulmonary phthisis.

MALIGNANT DISEASE OF THE PERITONEUM is usually secondary to cancer of one of the abdominal or pelvic organs, but the disease may not have attracted attention until the peritoneum has become involved, and in some cases the primary cancer is quite latent. As with tubercle, so here the main signs may be those of ascites, which can be of excessive amount, necessitating paracentesis. In that event the character of the fluid that is withdrawn is suggestive, for in peritoneal cancer it is often blood-stained, and microscopical examination may reveal in it great abundance of epithelioid cell-forms. After paracentesis, palpation

may detect masses and irregular tumours in the abdomen. The history of the case is of course of considerable importance in diagnosis, which mainly rests between this disease and cirrhosis of the liver. There are two forms of abdominal cancer in which the signs are generally fairly obvious. These are cancer of the omentum and colloid cancer of the peritoneum. When the omentum is affected it becomes thickened and contracted, forming a large lobulated mass with irregular margins situated in the lower epigastric and the umbilical regions. It is well defined, dull on light percussion, and generally separated from the hepatic area by a strip of resonance. The co-existence of such a tumour, in an elderly subject, with ascites (and perhaps jaundice also) and a history of progressive emaciation and pain would justify the diagnosis of omental cancer. On the other hand, the omentum may not be retracted as stated, but infiltrated in its whole extent so as to present a wide area of dulness reaching in the median line from xiphoid to pubes; and in such a case the diagnosis from malignant ovarian disease is very difficult. As regards colloid cancer, the greater part of the belly may be occupied by irregular masses separated by areas of resonance, the masses being more or less nodular and even distinctly elastic to the touch.

Tumours arising in the *mesentery* and in the *retro-peritoneal glands* may be found on palpation to be rounded, lobulated, but may not yield dulness, being overlaid by the intestine. The retro-peritoneal growths are moreover fixed, and cannot be moved by pressure or influenced by the movements of the diaphragm. In their case the diagnosis has to be made from renal tumours (*q.v.*) and from growths connected with the lumbar spine.

Passing now to consider inflammatory conditions of limited extent and involving the sub-peritoneal tissue as well as the serous membrane itself, the most notable and common is that described under the head of *peri-typilitis*. This condition, which arises in the vast majority of cases from ulcerative perforation of the vermiform appendix, is mostly a localized peritonitis or peritoneal abscess, so that what applies to it may, *mutatis mutandis*, be applied to such abscesses in general. For it is not every case of perforated appendix that leads to general and fatal peritonitis. Peri-typilitis is characterized by pain and tenderness in the right iliac fossa, where may be felt an area of resistance, and often a fairly well defined

swelling in the same region, which yields a dull note on percussion. In cases that proceed to suppuration, further signs appear, as redness and inflammatory œdema of the skin, followed by bogginess, and perhaps the crepitation of subcutaneous emphysema. In other cases the abscess, instead of pointing externally, will burrow down into the pelvis and ultimately open into the rectum or bladder, or else (as in a case recently under the writer's care) it will make its way in the deep layers of the abdominal wall even as high as the diaphragm. As to other abdominal abscesses, they may be found in almost any part of the belly, being, however, mostly the result of perforation of intestine, stomach, or gall-bladder, especially where such perforation has been so gradual as to have given time for the formation of peritonitic adhesions between adjacent coils of intestine, and thus to limit the focus of suppuration. A peri-typhlitic abscess may be confounded with a faecal tumour or a tumour of the cæcum, but the history of the case, the pyrexia, and the evidence of local inflammation will generally enable a correct diagnosis to be formed. It is only where a peri-typhlitis persists for a long time without resolving or suppurating that a doubt may arise as to the correctness of the original diagnosis. Sometimes a peri-nephritic abscess on the right side may invade the iliac region, but its extension from the loin and the history of renal symptoms suffice to distinguish it.

Before leaving this part of the subject it may be well to mention the fact that a *pelvic hæmatocele* or a *pelvic cellulitis* may extend beyond the limits of the true pelvis, and come to occupy the iliac fossa. In such cases, apart from the history, the result of vaginal examination will furnish facts for a diagnosis, by permitting of the detection of the swelling in Douglas's fossa and the displacement or fixation of the uterus.

III. Tumours, &c., connected with the Abdominal Viscera.—I. STOMACH.

—A *dilated stomach* may cause a marked prominence in the epigastric and left hypochondriac regions, so that the outline of the greater curvature of the viscus can be readily seen. In chronic dilatation the organ often assumes a lower position than normal, and the epigastric region may then be flat instead of rounded. On percussion a full tympanitic note is yielded by the swelling, whilst, if there be much fluid contents, a marked splashing can be produced by suddenly palpating it.

Not every *new growth of the stomach* is

to be detected by physical exploration; its presence can often only be inferred by the symptoms and course of the disease. But the existence of an obvious tumour materially favours the diagnosis. Thus, cancer of the cardiac orifice is beyond the sphere of external observation, and its symptoms are those of œsophageal obstruction; cancer of the pylorus can generally be detected by palpation, and it is accompanied by gastric dilatation. In either case there is extreme emaciation, rendering palpation easy. Scirrhus, the commonest form of pyloric cancer, may be felt during life as a hard nodule in the right of the epigastrium or the contiguous part of the hypochondrium. It is fixed, and indeed is frequently adherent to neighbouring organs, as liver or pancreas, being sometimes quite concealed by the former. If the new growth, cancerous or not, be seated in the anterior wall of the viscus, or near the greater curvature, it is far more mobile, provided that it has not progressed so far as to have caused the stomach to become adherent to the abdominal wall. Indeed, such a tumour may alter its relative position from time to time according to the varying state of distension of the viscus. It is usually held to be distinctive of gastric tumours, as contrasted with those of the liver (left lobe), that they are but little, if at all, influenced by the movements of the diaphragm. This is not absolutely the case, for certainly there may be some descent of such a tumour with inspiration, although the movement may not be so great as that of the liver itself. It is impossible to distinguish a gastric from a hepatic tumour if the former be adherent to the liver, for in that case the strip of resonancé, which otherwise may occur between the tumour and the area of liver dulness, does not exist. The tumour in the gastric wall varies in its degree of dulness with the distension of the stomach.

In not a few cases of simple *pyloric stricture* or *chronic ulcer* a nodular tumour may be felt, simulating a new growth, and a correct diagnosis can only be based upon the long duration of the symptoms, since in either case there is marked cachexia with general wasting. In the very emaciated subject of such disease even the normal pancreas may be mistaken on palpation for a growth in the stomach.

2. **INTESTINE** (omitting Hernial tumours).—*Flatulent distension* of the intestines gives rise to more or less general enlargement of the abdomen; it

is more marked in the colon as a rule; but in cases where the small intestines alone are distended, as in obstruction at the cæcum or above, then the flanks will appear flattened in comparison with the great prominence of the rest of the belly. In acute peritonitis the whole of the bowels may be distended, and the tense abdominal wall give a tympanitic note on percussion.

Apart from this condition there are three widely different causes of intestinal trouble productive of definite localized swellings or tumours. The first of these is *faecal accumulation*. In every case of suspected abdominal tumour the possibility of its being a mere faecal tumour must be borne in mind; hence it is always advisable to thoroughly clear out the bowels before arriving at a conclusion as to any abdominal tumour. A faecal tumour consists, then, in the lodgment in the large intestine of a mass of inspissated faeces. It may occur in the cæcum, giving rise to a swelling which has to be distinguished from the graver condition of typhlitis; the tumour is well defined, and not usually tender; it may be indented to a certain extent by the finger. Or it may be formed in any part of the colon, of which the sacculi, especially if the gut be dilated, afford convenient receptacles for such a lodgment of faeces without interfering with the daily evacuation. The sigmoid flexure is a favourite seat, and it must be remembered that this portion of bowel is prone to great variation in its position, according to the length of the meso-sigmoid; sometimes it lies on the right of the middle line. Similarly, the transverse colon may be considerably displaced, forming quite a U-shaped curve with the convexity approaching the pubes. Such changes in the position of the colon account for the appearance of these faecal tumours in various parts of the abdomen not occupied by the large bowel when normally situated. The tumour may be considerably below the umbilicus, and yet be formed in the transverse colon. A faecal tumour is easily grasped, dull on percussion, and sometimes has a manifestly doughy consistence, but the diagnosis requires for its confirmation the frequent administration of large enemata. Even then it may take some time to reduce its size or effect its dislodgment, and in some cases its gradual onward passage along the colon can be traced on palpation from day to day. The conditions for which such a tumour is liable to be mistaken are intussusception or an intestinal growth.

The tumour of *intussusception*, when present, is of characteristic shape, from the fact that it is formed by the invagination of a segment of gut into the portion just beyond it. Although no part of the bowel is exempt from such an occurrence, yet the most common variety is that in which the invagination begins at the ileo-cæcal valve, the ileum and cæcum being intussuscepted into the colon. Hence the usual site for the smooth, sausage-shaped tumour to occupy is either the right lumbar region or transversely across the belly in the upper part of the umbilical region. Yet in some cases it may even be formed on the left side, and the intussuscepted portion be felt *per rectum*. The diagnosis does not depend merely upon the presence of the tumour, but is largely based upon the history of the attack and the occurrence of symptoms of obstruction, of melæna, &c. It is in cases of so-called chronic intussusception that most difficulty arises, for in such cases the collateral evidence may be wanting to confirm the view taken as to the nature of the tumour (*see* **INTESTINAL OBSTRUCTION**).

New growths of the intestine are not very common. Those that are least rare seldom attain a size sufficient to render them palpable, or else they are seated in regions beyond the reach of the hand. Thus the commonest are the limited epitheliomata that are met with chiefly in the large intestine at the several flexures, where they form annular ulcers, and are a main cause of chronic obstruction. The same kind of malignant growth may occur in the cæcum, where also other varieties of tumour are met with; the diagnosis has to be made, not only from faecal tumour or intussusception, but also from peri-typhlitis; here the history of the case is quite as useful in differentiation as the determination of the presence of a swelling. In malignant disease the existence of enlarged glands or of œdema of the lower limb may assist in diagnosis. Much more rarely do we meet with cases of tumour (simple or malignant) in the small intestine. Such may be detected on palpation in any of the abdominal regions below the umbilicus, rarely above that level.

3. **LIVER AND GALL-BLADDER.**—The general characters of a tumour connected with the liver consist in its being situated in the right hypochondrium or epigastrium, in its accompanying the liver in its movements during the act of respiration, in the dulness obtained over the swelling being conterminous with that of

the liver, and in some cases—perhaps a minority—in its association with jaundice. An enlarged liver forms the most common variety of abdominal tumour.

Conditions of *chronic uniform enlargement*, such as that due to chronic congestion of cardiac disease, or to hypertrophic cirrhosis, fatty infiltration, waxy degeneration, or leukæmic infiltration, need merely be mentioned. They are fully described elsewhere, and the signs elicited by palpation and percussion are plain. The conditions with which they may be confounded are not those of other abdominal tumours, but rather with downward displacement of the organ itself.

There are also conditions of the liver which depend on causes productive of *distortion* of the organ, and produce swellings that may be mistaken for true tumours. The liver is sometimes remarkably deformed by the practice of habitual tight-lacing—a practice not confined to any one grade of the social scale—so that in extreme cases a considerable portion of the organ may be felt below the ribs as a hard, resisting, somewhat rounded tumour. Again, in syphilitic peri-hepatitis the liver may be greatly distorted, and present on its surface more or less large bosses which might be mistaken for malignant tumours.

Of conditions giving rise to localized swellings mention may first be made of *cysts and abscesses*. These fluid tumours are smooth, elastic, and, if not too deeply seated in the substance of the organ, fluctuating. It is well to remember that even a fatty liver, or some other condition (as leukæmia), whilst involving the whole organ, may by some local bulging give rise to an elastic swelling, and therefore a diagnosis may not be possible unless the swelling has been explored by a grooved needle or fine trocar. *Simple cysts* are too rare to require detailed notice; prior to exploration, they will probably be taken for hydatid cysts. The characters of *hydatid tumour* are only manifest when the cyst projects above the surface of the liver; but in cases where the hydatid is lodged deeply in the substance of the organ, the latter is more enlarged as a whole, or rather there is disproportionate size of the lobe involved. In some cases the cyst only just presents on the surface, and then it gives the impression of a solid, nodular growth. But, in the more ordinary event, it forms a smooth, elastic, round, or oval swelling, which, both by palpation and percussion, can be proved to be intimately connected

with the liver. The so-called “hydatid fremitus” is a modified sense of fluctuation, sometimes obtained by placing the palm of one hand upon the tumour, and striking the dorsum with the fingers of the other hand; a tremor or thrill is thereby perceived, this being doubtless due to the physical conditions of a cyst containing fluid, and provided with a tense, elastic wall. An exploratory puncture is necessary to establish the diagnosis, when the characteristic clear, thin, non-albuminous fluid will be withdrawn, containing, perhaps, scolices, hooklets, or shreds of laminated membrane. If supuration have taken place, the presence of pus is, of course, at once perceived. A degenerate and shrivelled hydatid is clinically indistinguishable from a solid growth (for further details, *see* HYDATID).

A *solitary abscess* of the liver may point below the ribs and appear in the hypochondrium as a prominent swelling, through which fluctuation may readily be obtained. The history of the case and the concomitant symptoms are of importance, and aspiration should be employed as an aid to diagnosis. In many cases, however, the abscess does not so project, but declares its presence by causing enlargement of the liver and other signs, the consideration of which does not come within the scope of this article.

The forms of *solid tumour* met with in the liver include syphilitic gummata and various kinds of malignant growth, the latter being mostly secondary to disease of other parts. Gummata seldom attain any large size; they may project from the surface of one or other lobe as a hard nodule, which, from its persistence without much change in size or affection of the general nutrition, is to be distinguished from a cancerous growth. Under anti-syphilitic treatment the tumour may entirely disappear. Cancer of the liver is not only mostly secondary, but also generally multiple. The organ is greatly enlarged, and numerous rounded, bossy prominences are to be felt on its surface; or—and this is more common in cases of primary cancer—there is one large firm tumour bulging from the hepatic lobe. As a rule, there is not much difficulty in the diagnosis, especially when, as often is the case, jaundice and ascites are present. In the latter event, if the effusion be not extreme, the liver can be palpated through the layer of fluid, which can be felt to be displaced. But many other kinds of abdominal tumour have been mistaken for hepatic growths—*e.g.*, fecal

tumour in the transverse colon, tumour of the right adrenal, or right kidney, or growths arising in the peri-renal tissues, or tumours of the stomach. In some of these cases a diagnosis is hardly to be made by physical examination alone.

Tumours formed by the *enlarged gall-bladder* or by new growths of this viscus deserve separate mention. In consequence of obliteration of the cystic duct from impacted calculus, or stricture following ulceration, or compression from without upon this duct or the common bile duct, the gall-bladder may become greatly distended and appear beneath the margin of the liver as a pyriform or oval swelling in the situation of the viscus. Such a tumour is tense, smooth, and it may be possible to detect fluctuation in it.

The undistended gall-bladder is not palpable, so that if the viscus can be felt it must be enlarged. In such a case there may or may not be a history pointing to gall-stone or evidence of malignant disease. The smooth ovoidal tumour in this situation is quite characteristic, and can hardly be mistaken for any other form of tumour. The gall-bladder may also be the seat of primary cancer, and in that case a firm, rounded tumour, dull on percussion, is to be found projecting below the rest of the lower margin of the right hepatic lobe. By its position alone can its true nature be surmised, for in all essential characters it resembles a tumour of the liver. In some cases of malignant disease of the gall-bladder there is a history of previous attacks of biliary colic.

4. **PANCREAS.**—Owing to its somewhat deep situation in the abdomen behind the stomach, an enlarged pancreas is not always palpable, whilst for the same reason the percussion note over it is resonant. In cases where the stomach is contracted and empty, however, even an unenlarged pancreas may be felt, especially at its head, its situation being to the right of the middle line at the upper part of the umbilical region. The only form of tumour that is likely to be met with is cancer of the organ, a disease which generally attacks the head of the pancreas; its hardness and fixity are distinguishing features; whilst, from its contiguity to the common bile duct, the growth generally is accompanied by obstructive jaundice. The tumours likely to be confounded with pancreatic are growths in the omentum or stomach; and if, as often happens, such growths have become adherent to adjacent structures,

and are consequently no longer mobile, a positive diagnosis may be impossible. The occurrence of fat in the stools is said to indicate pancreatic disease, and recently attention has been drawn to the fact that the stools may become clay-coloured in such cases, even although there may be no jaundice.

5. **SPLEEN.**—An enlarged spleen is for the most part readily detected by abdominal palpation. It is felt as a smooth tumour passing forwards from beneath the ribs into the left hypochondrium; its margin may be somewhat sharp or rounded, and the characteristic notch in its anterior border can often be detected. Again, on percussion the abdominal swelling is found to be continuous with the area of splenic dulness in the lower axillary region, whilst the fact that the tumour is superficial to the colon affords further proof of its nature. Moreover, the spleen accompanies the diaphragm in its movements. The conditions causing enlargement of this organ include the swelling met with in typhoid and septic fevers, in malaria, from chronic congestion, waxy disease, leukokythæmia, &c. (*see DIS. OF SPLEEN*). Localized tumours are not common; they include hydatid cysts and malignant growths. Occasionally the spleen is movable, but it retains its characteristic shape, and can be pushed upwards and backwards into its normal position.

6. **KIDNEY.**—The kidneys are, in moderately thin subjects, easily palpated, the surest way being to support the organ by means of one hand placed in the flank, whilst palpating the anterior margin and surface with the other hand. An enlarged kidney or a renal tumour may be diagnosed as such if the following characters are present:—The surface and margin are smooth, the latter being rounded and thick. There is resonance over the anterior half of the tumour, owing to the relation borne to the kidney by the colon. Then such a tumour is unaffected by the movements of respiration, and, indeed, except in the case of a movable kidney, its situation is fixed. These points may serve to distinguish a renal from a splenic tumour. The occurrence of urinary symptoms of course would materially aid in the differential diagnosis, but such symptoms are often absent.

Hypertrophy of one kidney—which may occur as compensatory to atrophy or congenital absence of its fellow-organ—may render the kidney more readily palpable than it normally is, but the

actual diagnosis of this condition is seldom determined during life.

One or both kidneys may be *movable*—that is, from the laxity of the fatty tissue around the organ, or the wasting of this tissue, the kidney may become gradually capable of being displaced from its bed according to the position of the patient, or it may readily be so displaced by manipulation. The majority of instances are met with in women who have borne many children, and in whom, therefore, the abdominal walls are remarkably lax. The practice of tight-lacing has by some been held responsible for displacement of the kidney, especially the right one. The right kidney is more frequently mobile than the left, but in the same subject both may present this abnormality. Sometimes the condition gives rise to considerable discomfort or inexplicable pains. The diagnosis rests upon the following points:—(1) The detection of a smooth, firm tumour in the abdomen, of the shape and size of a kidney, and capable of being moved between the hands; (2) although lying, perhaps, close to the middle line of the body, it may be pushed backwards into the loin; (3) when the patient is lying prone, a distinct hollow is to be seen in the lumbar region, where the kidney ought to lodge, and a resonant note may be found to have replaced the normal area of kidney dulness; (4) the patient will experience a peculiar sensation when the organ is compressed by the hand. The only other mobile tumours likely to be mistaken for a movable kidney are fibroid tumours of the uterus, which are sub-peritoneal, are furnished with a long pedicle, and are of the size of the kidney. Ovarian tumours under similar conditions may also simulate movable kidney. Nevertheless, the latter has sometimes been mistaken for a fecal tumour, or a tumour of the liver, gall-bladder, &c.

When, in consequence of obstruction to the outflow of urine, the pelvis and calyces of a kidney become dilated and distended with urine (*hydro-nephrosis*) or pus (*pyo-nephrosis*), the condition is characterized clinically by the appearance in the lumbar region of the abdomen of a prominent swelling, which may extend as far forwards as the umbilicus, or even beyond it. The tumour is smooth, elastic, or fluctuating, rounded, and fixed; perhaps it is dull over its whole extent, or anteriorly the resonance of the intestine may limit the percussion area. In some such cases additional evidence of its true nature may be afforded by the tumour

alternately increasing and dwindling in size, the latter event being accompanied by an unusual increase in the flow of urine or in the amount of pus that is discharged with the urine (intermitting hydro- or pyo-nephrosis).

Although widely differing in their pathological characters and also in their clinical history, there is much resemblance, so far as regards the characters of the tumour to which they respectively give rise, between the enlargement produced by *tubercular disease* of the kidney and that caused by *calculous pyelitis*. In either case a large tumour is to be felt in the loin, where the patient generally complains of pain of a constant, aching character. There may be manifest fulness in the loin, and the tumour may seem to be lobulated; it probably also appears to be solid, for although the kidney is really reduced more or less to the condition of a chambered sac containing pus, yet, owing to the thickness of the chronically inflamed capsule, no evidence of the presence of fluid contents may be obtained. The peri-nephritis that so commonly results from these forms of suppurative disease of the kidney may itself pass on to suppuration, and an abscess be formed in the region of the tumour, or burrow in the abdominal wall, where its presence may be recognized. As to the differential diagnosis between these two diseases, it must suffice here to point out that calculous pyelitis may be suspected if there has been a history of previous attacks of renal colic and hæmaturia; whilst in cases of tubercular kidney the symptom of pyuria (which is common to both conditions) may be associated with evidence of tubercle in other organs, as the lungs or intestines, or, if the patient be a male, in the other parts of the genito-urinary tract—*e.g.*, the vesiculæ seminales, spermatic cord, testes, bladder, or prostate. In either sex, if the ureter be involved, it may be possible to detect it as a thickened cord passing down from the region of the kidney.

Renal or peri-renal *new growths* may attain considerable dimensions, and thus come into close contact with neighbouring organs, so as often to lead to much difficulty in diagnosis. This is especially the case with tumours of the right kidney, which may most closely simulate tumours of the liver, both to palpation and percussion. On the left side a renal tumour may mostly be differentiated from an enlarged spleen by the points already mentioned. It may be noted that one form of neoplasm—*viz.*, renal

sarcoma—is especially common in early life; otherwise, renal cancer occurs in old subjects, like cancer elsewhere. A history of hæmaturia is not always to be obtained, for the growth in its progress may have blocked the ureter. The advancing emaciation without pyrexia, and the age of the patient, may assist in the differentiation of cancer from tubercular disease. Peri-renal tumours (generally myxomata) are rare, and the absence of any renal symptoms with them may quite obscure their diagnosis.

7. SUPRA-RENAL CAPSULE.—The position of the supra-renal capsules renders it practically impossible to determine whether an abdominal tumour in either hypochondrium has arisen from one of these organs. During life such growths present the characters of tumours of the liver or kidney; and, as they do not produce any symptoms referable to the organ in which they are seated (for cancer of the adrenals does not produce the symptoms of Addison's disease), there are no criteria upon which to rely for their diagnosis.

8. FEMALE PELVIC ORGANS.—Tumours arising in connection with the ovaries and uterus very often pass out of the narrow limits of the pelvis and occupy the abdominal cavity. Indeed, they constitute by far the majority of abdominal tumours in the female sex, and must therefore be briefly discussed in this article.

First in importance and frequency are *ovarian* (and *par-ovarian*) *cysts*, which sometimes attain enormous proportions. They may be unilocular or multilocular. If the cyst be *unilocular* and of great size, it may form a tumour that reaches from the pubes nearly to the xiphoid, and may occupy an almost central position. As a rule the tumour displaces the intestines, and dulness may be elicited over the whole area of the cyst. Fluctuation may be easily obtained, the diagnosis from ascites being founded on the fact that the flanks are resonant, and that the dulness, which may occupy the whole of the central regions, does not shift with the position of the patient. More difficulty is experienced in the diagnosis when the case is complicated with ascites, and when some coils of intestine pass in front of the tumour with which they have become adherent. In cases where the cyst has not attained so large a size, the enlargement of the abdomen is less symmetrical, and both to inspection and to measurement one or other of the two halves of the lower segment of

the abdomen will be found to be of larger size. The measurement is made by comparing on the two sides the distance between the umbilicus and anterior superior iliac spine. Then on inquiry it may be learnt that the swelling was at first more unilateral than it appears at the time of examination. In all cases of abdominal tumour in women a vaginal examination should be made; and in cases of ovarian tumour the uterus will probably be found to be drawn up or otherwise displaced by the tumour. In all cases, also, the precaution should be taken to empty the bladder and rectum before making an examination. If the cyst be *multilocular*, the diagnosis may not be so easy. The tumour is then more lobulated, firm and resisting in parts, elastic or fluctuating in others. A *dermoid cyst* would give the impression that one was dealing with a *solid growth*, whilst the latter are sometimes indistinguishable from large uterine fibroids.

The *tumours of the uterus* most likely to invade the abdominal cavity are the fibro-myomata, commonly known as fibroids—sub-peritoneal or intra-mural. Such a tumour may be felt through the abdominal wall in the hypogastric and umbilical regions as a very solid, perhaps lobulated swelling, which may not be dull on percussion in its whole extent, owing to the intervention of coils of intestine between the tumour and the parietes at the upper part of the former. Much is to be learnt by a vaginal examination conjoined with abdominal palpation in the diagnosis of such cases.

The swelling formed by a *hydrosalpinx* or *pyosalpinx* may attain such size as to be distinctly perceived in the iliac region, but the points in the differential diagnosis of such conditions will be found elsewhere. Nor need we do more than mention here the fact that an *extra-uterine pregnancy* gives rise to an abdominal tumour the true nature of which is largely inferred from the history of the case.

It is perhaps hardly necessary to mention that the *enlarged uterus* in advanced pregnancy forms a tumour capable of being mistaken for a growth; but here again the history of the case, as well as the concomitant signs of pregnancy, seldom fail to enable the observer to arrive at a right conclusion.

IV. Tumours connected with Bone.—A few words only will suffice to mention the features of new growths proceeding from the vertebral column or pelvis, and projecting into the abdominal cavity.

Sarcomata, osteomata, enchondromata, and myxomata are the more common forms of new growth in this situation; and the ilium, sacrum, or sacro-iliac synchondrosis are perhaps the chief seats of origin. Their differentiation from tumours connected with the abdominal or pelvic viscera is determined mainly by their fixity, and in the latter case by the results of vaginal and rectal exploration. Most of these tumours also are very firm and unyielding, but there are cases recorded, especially in connection with the ilium, where a rapidly growing sarcoma has not only a softer character, but is even pulsatile. Tumours growing from the ilium or sacrum sometimes extend through the sciatic notch and appear upon the buttock. In such cases sciatica may be the chief symptom.

V. Abdominal Aneurysm.—No account of abdominal tumours would be complete which failed to notice the subject of aneurysm of the abdominal aorta and its branches. These aneurysms are mostly saccular, and can be felt as more or less globular tumours generally seated in the umbilical region and to the left of the middle line. The distinctive characters of such a tumour consist in, first, its pulsatile nature, and particularly its lateral expansion, as ascertained by placing the fingers of each hand on either side of the swelling, and noting their lateral divergence with each cardiac systole; secondly, the fixity of the tumour, so that it retains its position when the patient is on his hands and knees; thirdly, the presence of a single or double bruit on auscultation over the swelling. In most cases the existence of resonance over the tumour proves that it is behind the intestines. If the aneurysmal sac be filled with clot, the tumour will feel firm, it will have no lateral pulsation, and will be indistinguishable from a tumour seated over the aorta. In cases of aneurysm there is generally a history of pain in the abdomen or back due to the pressure of the advancing tumour. The simulation of aneurysm by an abdominal abscess which pulsates by its contiguity with the vessel has been already mentioned. Another condition liable to be mistaken for aneurysm is that of so-called pulsating aorta; this is met with in the subjects of dyspepsia, hypochondriasis, and other neurotic states; it may be a source of much discomfort to them. It is differentiated by the fact that the pulsation is diffuse; there is no definite tumour, no evidence of vascular disease

elsewhere, nor history of injury, and, on auscultation, no bruit is heard unless pressure be made on the vessel. It may be necessary to examine the case under chloroform, as the patient is very likely to keep the rectus muscle rigid, and the absence of a tumour cannot be positively affirmed unless free manipulation has been practised.

VI. Phantom Tumours.—The class of "*phantom tumours*" is of some interest in abdominal diagnosis. These are swellings, generally smooth and rounded, which may occur in any part of the belly, and may come and go like a movable kidney. Met with in hysterical or neurotic subjects, a *phantom tumour* may be mistaken for a faecal tumour, or even graver conditions. Percussion sometimes yields an imperfectly resonant or even dull note, and the patient may complain that the swelling is painful and tender. Produced by localized muscular contractions or by limited distension of intestine, such a tumour may disappear during sleep and under an anæsthetic.

The following classification of the varied conditions which have been thus briefly reviewed is based upon the comparative frequency with which they produce respectively either a more or less general intumescence of the abdomen, or a swelling limited to one or other of the abdominal regions. It is not to be interpreted as indicating that the tumours mentioned are strictly confined to these regions, but only that they are most commonly found there.

A.—CONDITIONS PRODUCING GENERAL INTUMESCENCE.

Tympanites.

Ascites.

Chronic Peritonitis with Effusion.

Tubercular Peritonitis.

Cancer of Peritoneum.

To which may be added, as causing considerable enlargement extending over a great part of the abdomen—

Ovarian or Par-ovarian Cyst.

Fibroid Tumour of Uterus.

Gravid Uterus.

Distended Bladder (extreme).

B.—CONDITIONS PRODUCING PARTIAL OR LOCAL SWELLING.

a.—In Variable Regions.

Phantom Tumour.

Abscess or Tumour in Abdominal Wall.

Fæcal Tumour.

Colloid Cancer of Peritoneum.

Peritoneal Abscess, or Limited Peritonitis.

Cancer of Intestine.

Intussusception of Intestine.

b.—*Limited usually to Definite Regions.*

1.—*R. Hypochondrium.*

Tumours of Liver and Gall-bladder.

Tumours of Right Kidney.

2.—*L. Hypochondrium.*

Tumours, &c., of Spleen.

" of Left Kidney.

3.—*Epigastrium.*

Tumours of Stomach.

" of Pancreas.

(In this region also an abdominal tumour may be simulated by a contracted rectus muscle or a phantom tumour.)

4.—*Umbilical Region.*

Extension of foregoing,

(3), (2), and (1).

Cancer of Omentum.

Tubercular Glands.

Abdominal Aneurysm.

Movable Kidney or Spleen.

5 and 6.—*R. and L. Lumbar Regions.*

Tumour, &c., of Kidney.

Peri-nephritic Abscess.

Enlarged Liver (R.) or Spleen (L.).

Cancer of Retro-peritoneal Glands.

7.—*R. Iliac Region.*

Typhlitis & Peri-typhlitis.

Cancer of Cæcum.

8.—*L. Iliac Region.*

Cancer of Sigmoid.

Whilst there are common to either R. or L. Iliac Region such tumours as are formed by—

Ovarian Disease.

Pelvic Hæmatocele.

Pelvic Cellulitis.

Sarcoma, &c., of Ilium.

9.—*Hypogastrium.*

Tumour of Bladder.

" of Uterus.

" of Pelvis.

Pelvic Abscess, &c.

SIDNEY COUPLAND.

productive power in either parent : anæmia, uræmia, jaundice, cancer, or peritonitis in the mother. Probably many of the causes to be hereafter mentioned act by causing the death of the fœtus. (2) *Diseases of the membranes or placenta.*

—Atrophy of the decidua, myxomatous degeneration of the chorion, separation of chorion or placenta with hæmorrhage into it, and hydramnios. (3) *Diseases of the uterus.*—Fibroids, cancer, endometritis, adhesions binding down the uterus and preventing its enlargement, displacements of the uterus, and possibly lacerations of the cervix.

B. *General.*—Acute febrile diseases, such as scarlatina, typhus, enteric fever, small-pox, cholera, relapsing fever, pneumonia; Bright's disease; acute atrophy of liver; diseases obstructing the circulation, such as cardiac dilatation, capillary bronchitis, cirrhosis of liver; most exhausting diseases.

C. *Accidental.*—(1) Local violence, either accidental injury or intentional interference. (2) Reflex influences, emotional disturbances, as from fright; over-fatigue or excitement; mammary irritation, as from hyper-lactation; sexual excesses; violent vomiting or purging; shock of operations, or severe general injuries. (3) Poisons: ergot, savin, rue, cantharides, carbonic acid, lead, and other rarer poisons.

D. There are patients who abort in pregnancy after pregnancy, and the cause of abortion is not discovered. It is therefore set down to a "*habit of aborting.*"

Symptoms.—Pain and hæmorrhage are the most important symptoms; if, in addition, there be dilatation of the cervix, abortion is probably imminent. Early in pregnancy, hæmorrhage usually precedes the pain, which is not severe; at a later period the pain is greater, and precedes the hæmorrhage. The pains are like those of labour, rhythmical, intermittent, referred to the pelvic region, and not affected by position; but they are far less severe. The hæmorrhage is the important symptom, and comes from uterine vessels laid open by detachment of chorion or placenta. If a small part only be detached, the vessels may become closed by thrombosis, and the pregnancy go on. If there be extensive detachment, the fœtus will die and abortion take place. As successive uterine contractions force the ovum onwards into the cervical canal, more vessels are torn through, and more blood is effused, the hæmorrhage only ceasing when the

ABORTION is the premature expulsion of the ovum before the child is viable—that is, before the end of the sixth month. Its causes may be classified as follows:—

A. *Local.*—(1) *Disease of the fœtus.*—Anything which causes the death of the fœtus may produce abortion. Among such causes are syphilis and feeble re-

uterus is empty and contracted. Sometimes, however, a dead fœtus is retained for weeks or months without provoking any attempt on the part of the uterus to expel it. In the first two months of pregnancy, the ovum is usually expelled entire; later, the membranes often rupture, and the fœtus comes away, leaving the placenta to be subsequently extruded or removed. After the first three months this is the rule.

The *diagnosis* is not difficult if the patient is known to be pregnant, although there may be difficulty in deciding as to the pregnancy. When dilatation of the cervix has taken place, abortion is inevitable. Before dilatation has occurred, the guide as to the need of interference is the amount of hæmorrhage, which should be estimated by its effect upon the patient's colour and pulse.

The chief dangers from abortion are hæmorrhage and septicæmia. The best method of arresting hæmorrhage before the cervix is dilated is to plug the cervix with a tent; after the cervix has been dilated, to empty the uterus. Septicæmia is to be prevented by antiseptic precautions.

Treatment.—(1) *Prophylactic.*—If there be reason to suspect syphilis, mercury should be given to the mother; if she be anæmic, iron may be required. Exposure to influences likely to induce abortion should be avoided, and any symptoms seeming to threaten abortion should be treated without delay.

(2) *Hæmorrhage and pain have commenced. Hæmorrhage is slight, and the cervix not dilated.* The patient should remain in bed, and take pot. bromid. gr. x, with ext. viburni prunifolii liq. ʒj (not official), every four hours. If there be pain, liq. morph. hyd. $\mathfrak{m}\mathfrak{v}$ or $\mathfrak{m}\mathfrak{x}$ may be added to this. Should the hæmorrhage continue for some days without increase in quantity, and should no further symptoms appear, the patient may be allowed to get up, and take ext. ergotæ liq. ʒss three times daily.

(3) *Hæmorrhage is profuse, and the os not dilated.*—The cervical canal should be plugged with a sponge tent, which, before it is inserted, should be dipped in a solution of corrosive sublimate in glycerine, 1 in 1000. The tent will at once restrain hæmorrhage and dilate the cervical canal.

(4) *The cervix is dilated, and hæmorrhage profuse.*—If a tent has been used, a vaginal douche of 1 in 2000 corrosive sublimate should be given. Then the anterior lip of the cervix should be

seized with a volsella and pulled down. The finger should be passed into the uterine cavity, and the ovum detached. If the finger cannot reach the fundus, it should be pressed down by the hand on the abdomen until it is within reach. When the ovum (or the placenta) has been detached, it should be grasped with a pair of ovum forceps, and extracted. Then the finger should ascertain whether the whole of the uterine contents has been removed; if small fragments are felt attached which the forceps fail to hold, the wall of the uterus may be scraped with a blunt curette. If hæmorrhage continue, the body of the uterus should be compressed between the hand on the abdomen and two fingers in the vagina; this will almost invariably stop it. Should it not, the interior of the uterus may be swabbed with a piece of cotton-wool dipped in a 1 to 6 solution of perchloride of iron. Lastly, the vagina should be syringed with a 1 in 2000 solution of corrosive sublimate. For the manipulations which have been described chloroform may be necessary, and will generally be advantageous. Under anæsthesia, the dilatation of the cervix and emptying of the uterus may be done at one operation by using Hegar's dilators. It is scarcely needful to add that hands and instruments should be scrupulously clean, and should be dipped in a 1 in 2000 solution of corrosive sublimate before putting them into the uterus.

(5) *The cervical canal is dilated, or dilating, but the hæmorrhage is not profuse.*—The patient should be advised to keep her bed, ext. ergotæ liq. ʒss being given every four hours.

(6) *The discharge contains bodies looking like white currants.*—The case is one of myxomatous degeneration of the chorion. A sponge tent should be put in the cervix, and ergot given. The uterus will then probably soon expel the tent and the diseased ovum. After the uterus has been emptied, the patient should be given ext. erg. liq. ʒss three times a day, and an antiseptic injection used twice daily. The patient should keep her bed for at least a week.

(7) *If the case be not seen until the fœtus has been expelled and the cervical canal has contracted, unless the discharges have been saved for inspection, it may be impossible to say whether or not the placenta is still in utero.* In this condition, if the hæmorrhage is slight, ergot should be given, an antiseptic douche used twice daily, and the patient

kept in bed. Under this treatment the placenta will often be expelled without ill consequences happening. If the discharge become offensive, or the hæmorrhage be profuse, the cervical canal should be dilated, and the uterine cavity explored and emptied, as described under (4). As an antiseptic douche after abortion is complete, carbolic acid 1 in 100, or Condy's fluid 3ss to Oj, may be used; but for use immediately after manipulation of the parts, sublimate is better, because more trustworthy.

G. E. HERMAN.

ACNE.—*Acne Vulgaris* is an inflammatory, usually chronic, disease of the sebaceous glands and immediately surrounding skin, resulting from the retention of plugs of altered sebum (comedones) in the gland ducts. The lesions are papular, tubercular or pustular, according to the severity of the inflammatory process, and are usually situated upon the face, neck, shoulders and back, only the palms and soles being invariably exempt from the disease. The individual lesions consist of minute, pink, acuminate papules or pimples, in the centre of which is a black-topped comedo (*A. punctata*, *A. papulosa*), or of more extensive peri-follicular infiltrations resulting—especially in strumous subjects—in chronic, livid indurations (*A. indurata*) or dermic abscesses (*A. pustulosa*); these forms usually co-exist in varying proportions, and appear in successive crops, which run a rapid course, cicatrices resulting from those which deeply implicate the cutis surrounding the gland ducts. The cicatrices are frequently the starting-point of keloid tumours. The condition, as a rule, gives rise to comparatively little pain, but exceptions are not infrequent.

Acne usually shows itself about puberty, when a remarkable development of the sebaceous gland system takes place, and is common up to the age of thirty, other forms of sebaceous disease being frequently associated with it. It affects both sexes about equally, and appears to be intimately connected with the generative organs, any functional derangements of which (menstrual disorders, sexual excesses, masturbation, &c.) are frequent concomitants, although the nature of the supposed "reflex" connection is by no means clear. It is stated that eunuchs are very rarely affected. The disease may occur in persons in robust health, but is much commoner in the debilitated and anæmic, and especially in dyspeptics who suffer from habitual constipation.

The theory that an atony of the *musculi arrectores pilorum* is the immediate cause of the retention of sebum, although highly probable and generally accepted, is obviously incapable of experimental proof. The condition is usually worse in winter than in summer; persons who have coarse, hairy, or greasy skins are specially prone to suffer from acne; there is no satisfactory evidence of its dependence upon scrofula or any other constitutional taint. The habitual use of cosmetics is probably conducive to its occurrence and continuance; it is common after variola and around patches of lupus, keloid or other diseases producing scars, probably from cicatricial obstruction to the excretory ducts.

Acne Varioliformis (*A. atrophica*, *A. frontalis*) is a rather rare form of the disease, which usually affects the forehead, temples, and hairy scalp. The eruption usually remains confined to these regions, but may occasionally spread over the neck to the back and chest. It generally occurs in middle-aged or old people, and has a marked tendency to relapse or to become chronic, with periodic exacerbations, which may occur at regular intervals. The lesions, which may be sparse or thickly aggregated, consist of small, hard, flat or acuminate papules, not preceded by comedones and not demonstrably connected with sebaceous glands; in the scalp they generally occupy the frontal, temporal and sagittal regions. They are indolent, but the majority ultimately suppurate and scab, their subsidence being followed by deep, punched-out, circular pits, which are at first pigmented, but gradually become white like the scars resulting from small-pox. By some authorities the disease is considered to be a late syphilide, but in the majority of cases evidence of syphilitic infection is certainly wanting.

Acne Cachecticorum occurs only in starved or debilitated persons after long wasting diseases, especially phthisis. Flat, livid, acneiform papules and pustules without comedones develop over the whole body, especially on the trunk and lower extremities; they cause deep, pigmented scars, and are not amenable to treatment.

Differential Diagnosis.—*Acne vulgaris* may be confounded with rosacea, pustular dermatitis-syphilis, mild varioloid, and with dermatitis due to the internal use of the bromides and iodides, or to the external application of chrysarobin, pyrogallie acid, or various tars (*see*

MEDICINAL RASHES). Acne varioliformis may be mistaken for variola, and is closely simulated by the small pustular syphilide.

Treatment of Acne.—(1) Constitutional treatment is of the first importance, and must be directed towards the anæmia, dyspepsia, constipation, or sexual derangements which usually accompany the disease; the necessity for exercise and a simple dietary must be enjoined. Among special remedies may be mentioned cod-liver oil—particularly in young persons and in *A. varioliformis*—sulphide of calcium, ergotine, phosphorus, and minute doses of perchloride of mercury, all of which are occasionally useful. The value of arsenic, except as a general tonic, is dubious.

(2) Local treatment to prove efficacious must be active and persistent; occasionally pain and inflammation indicate the use of fomentations, calamine lotion, or other soothing applications, but the majority of cases call for stimulant treatment. Comedones should be expressed at bedtime, the skin having been previously softened by steaming or bathing with hot water, then vigorous friction made with soft soap and flannel or a flesh-brush, and lotions or ointments containing sulphur (gr. xv ad 3j with glycerine and lime-water), sulphuret of potash (5j to a quart of water), corrosive sublimate (gr. j or ij ad 3j), tincture of iodine, iodized glycerine, spirits of camphor, or ichthyol applied, and allowed to remain over night. Medicated soaps containing sulphur, naphthol, or thymol are specially recommended for daily use. Indurated papules are often absorbed after the application of a belladonna or mercurial plaster, or may be touched with strong carbolic acid or the acid nitrate of mercury. Dermic abscesses ought to be freely incised, their contents expressed, and cooling lotions or compresses applied.

J. J. PRINGLE.

ACNE ROSACEA may be defined as a chronic, inflammatory, composite disease affecting the skin of the face in which erythema, hypertrophy, telangiectases, and sebaceous disorders are present in varying proportions. From this definition it will be seen that the name commonly attached to the disease is somewhat of a misnomer, the acneiform lesions being, as it were, secondary or accidental features of it. Persons, however, who have suffered from ordinary acne in early life are prone to become

the subjects of rosacea in middle life, when the disease is most common. It is generally considered to be a reflex vasomotor neurosis, and may result from disorders of digestion (especially flatulent dyspepsia with acid eructations and constipation), from habitual alcoholic excesses, and especially from menstrual disorders; this latter circumstance explains the much greater frequency, at all events of its milder, non-hypertrophic forms, in the female than in the male sex. Its subjects are frequently of neurotic temperament, and suffer from hot or cold extremities, evidences of "mobility" or ill-balance of the peripheral circulation. In such persons exposure to heat or cold, or the use of inappropriate cosmetics, may be the determining cause.

The disease is characterized by its chronicity and by the variations which it undergoes from day to day or even from hour to hour. Its mildest form is exemplified by the flushing of the nose, cheeks and ears, attended with burning or tingling sensations, which so frequently follows the ingestion of certain foods, of alcoholic stimulants, or of tea, coffee, soup, or other hot liquids. Gradually these attacks become longer in duration, until finally some erythema becomes persistent, especially about the nose and cheeks, the affected part being slightly infiltrated and of a somewhat "butterfly" shape. The colour at this stage entirely disappears upon digital pressure, and the temperature of the patch is slightly elevated; its edge is sometimes pretty clearly defined, but more usually merges gradually into the normal skin, and its extent varies with the digestive and other conditions previously referred to. The forehead and chin also frequently become implicated, and it may extend to the scalp, especially in bald persons, or more rarely still to the neck.

In a considerable proportion of cases, especially, perhaps, in persons of eczematous habit or with thick oily skins and liable to steatorrhœa, implication of the sebaceous glands is a marked and early feature. It may result in a seborrhœa oleosa, which gives the part a glistening or greasy look, or in comedones and characteristic acne lesions, culminating in "pimply" papules, tubercles and pustules, either sparsely distributed over the erythematous area or closely grouped. The consequent disfigurement is sometimes very great, and the discomfort and unhappiness derived therefrom are increased by a knowledge of a popular delusion that the condition is always the

result of intemperance. There is often general dilatation of the sebaceous gland ducts over the affected area, and it may become the seat of a secondary eczema (E. seborrhœicum), which may spread widely and mask the original nature of the malady. As the result of the long-standing over-distension of the capillaries and venules, and of the impaired tone of their coats, they dilate and become varicose, and constitute visible or even prominent objects, especially upon the ale and about the tip of the nose. Such is a picture of the commoner, non-hypertrophic type of the disease.

The hypertrophic form is much commoner in men than in women, especially in those who combine habitual alcoholic excesses with occupations which necessitate exposure to all vicissitudes of climate—e.g., bus drivers, cabmen, &c. The hypertrophy is generally confined to the nose and its immediate neighbourhood (rhinophyma, lipoma nasi). The distension of veins is usually marked, and, despite the brilliant redness, the part feels cold to the touch. The chronic inflammation, infiltration, and inflammatory new growth of the skin result in enlargement of the nose, which sometimes assumes enormous proportions; generally it is somewhat bi-lobate in form, the two halves being separated by a sulcus, and the hypertrophied organ may hang down in a pendulous manner over the upper lip and mouth. The lumen of the nostrils is not, however, usually encroached upon. From the foregoing sketch the *pathological anatomy* may be inferred. It includes congestion of the cutis vera, beginning in the lower to extend to the more superficial longitudinal plexus, paralytic distension of vessels with thickening of their coats, diapedesis of leucocytes, and the formation of new connective tissue around them, and sometimes special implication of the sebaceous glands and their ducts.

The *differential diagnosis* must be established from acne vulgaris, eczema, lupus vulgaris, lupus erythematosus, and dermatosyphilis. Only the two latter present sufficient resemblance to rosacea to render confusion probable. In L. erythematosus the presence of atrophic scarring may always be determined; but certain late syphilides closely simulate rosacea, especially when combined with iodic acneiform lesions. It appears to the writer that all three conditions (i.e., rosacea, dermatosyphilis, iodic acne) are not infrequently co-existent.

The results of *treatment* are generally

satisfactory, but seldom permanent. Careful attention to diet and regimen is of the highest importance. Alcohol is as a rule to be studiously avoided; hot tea, coffee, cocoa, and soups, spiced dishes, and starchy vegetables must be interdicted. Moderate exercise short of fatigue is generally advisable; tight-lacing is to be strongly condemned, as it appears to the writer to be a common and generally unsuspected cause of the complaint. Special attention must be paid to regular and copious action of the bowels, the drugs most generally useful for this purpose being sulphur and senna—as confection—aloes, cascara sagrada, compound liquorice powder, and the salines, preferably in the form of the purgative mineral waters of Hunyadi Janos, Carlsbad, Püllna, Friedrichshalle, &c., taken on rising, with an equal quantity of warm water. The familiar iron and magnesia mixture is often of great use. Menstrual and uterine derangements must be treated on the lines laid down in the articles devoted to them, but special reference may here be made to the utility of the prolonged warm douche in chronic inflammatory conditions of the pelvic organs.

Generally speaking, no remedy is so useful for the gastric troubles as bismuth, either in the form of carbonate or subnitrate, combined, it may be, with the alkaline bicarbonates, dilute hydrocyanic acid, and vegetable bitters according to circumstances. In other cases the dilute mineral acids are valuable, and liquor strychninae (mij to v) may be often advantageously given with them. Among supposed “vaso-motor steadying” drugs, ichthyol certainly appears to have more decidedly beneficial effects than ergot, belladonna, or arsenic; it may be given in the form of gelatine-coated pills, each containing $2\frac{1}{2}$ grains, two being taken immediately after each meal, and the dose being gradually increased according to the tolerance of the patient for the drug, which is a very disagreeable one.

Local measures are also of the highest importance. In mild erythematous phases a lactate of lead lotion is most valuable; it is made by mixing a drachm of liq. plumbi subacetatis with an ounce of fresh milk, and may be dabbed on night and morning. Calamine lotions, (gr. xx—5j ad 3j) with glycerine, lime-water, and rose-water, are of the greatest use, and, when acne is a prominent feature, sulphur lotions, as described under that head, are applicable. Hypochloride of sulphur freshly prepared (3j—3ij to the

ounce of lard) with carbonate of potash (grs. x) and a little almond oil constitutes a favourite remedy in similar circumstances, and Unna's ichthyol plasters are also useful.

Dilated veins may be opened longitudinally with a fine scalpel, free bleeding being afterwards encouraged by warm bathing, and their obliteration results from the operation, but may perhaps be more satisfactorily attained by electrolysis, the negative pole being inserted into the venule while the positive is held in the hand. A current of 2-5 milliamperes, generated by three or four cells, is usually sufficiently powerful, and does not cause scarring. Puncture of the pimply lesions with Kaposi's acne lancet and multiple linear scarifications often yield excellent cosmetic effects. Excision is the only procedure applicable to the enormous hypertrophic growths, and its results are remarkably satisfactory. the wound generally healing with great readiness.

J. J. PRINGLE.

ACONITE, Poisoning by.—The leaves and root are the parts most often taken. *Symptoms.*—A cool, numbing sensation in the mouth and throat sets in almost at once; this is followed by numbness, tingling, and loss of power in the legs. There is generally acute pain in the stomach, with vomiting and purging; the pupils are dilated, the vision impaired, and the pulse exceedingly feeble. Death may take place from syncope, and is preceded by collapse and clammy perspiration. There are no special post-mortem appearances. *Treatment.*—The patient must be kept in the recumbent position, vomiting should be encouraged by emetics, and the stomach should be washed out; digitalis (20-minim doses of the tincture) or atropine (gr. $\frac{1}{16}$ hypodermically) may be used as antidotes. Artificial respiration may be necessary; the patient must be kept warm, and stimulants freely administered.

ACROMEGALY.—The term "acromegaly" (ἄκρον, extremity; μεγάλη, large) was suggested by Marie, of Paris, for a condition which is characterized mainly by hypertrophy of the hands, feet, and face. The pathological nature of this affection is obscure. Examples of the disease have been described from time to time under various names, but the subject did not attract general attention until the publication of Marie's first paper in the *Revue de Médecine*, April 1886.

Symptoms.—The most striking feature of the disease is an enormous enlargement of the hands and feet, both bony and soft parts being involved. The hands and feet, though gigantic, are not deformed, and the skin over them is not materially altered in its appearance or in its functions. There is sometimes a disproportionate development of fat in the parts normally well supplied, such as the ulnar border of the hand and the heel. In spite of the gigantic size of the hands, they are not unwieldy, and delicate operations, such as threading a needle, are performed readily. The nails are broad, vertically grooved and occasionally large. Sometimes the wrists are enlarged, and rarely the lower part of the forearms, but the arms are never affected. The legs do not undergo general hypertrophy, but it is not uncommon to find thickening of the malleoli, head of the fibula, patella, and condyles of the femur. The face becomes elongated, and the outline oval; the nose is much broadened, the cheek-bones prominent, the lower lip thick and everted, the chin square and massive. The neck is short and thick, and partly on this account, and partly on account of the enlargement of the lower jaw, the chin tends to fall on the upper part of the sternum. The eyelids and sometimes the ears undergo hypertrophy; the tongue is often enormously enlarged. The teeth are not hypertrophied, but the intervals between them are frequently widened. In consequence of the enlargement and projection of the lower jaw, the teeth do not meet those of the upper jaw, but protrude in a very remarkable way. The frontal eminences sometimes become unduly prominent, and the vault of the skull may present some slight increase in size. The skin often has a yellowish-brown tinge, and is coarse, flabby, and somewhat dry; but these changes may be absent. In some instances, on the other hand, excessive perspiration has been noted. It is important to add that the dryness of the skin never approaches the degree of harshness seen in myxœdema. The male and female genital organs have been found hypertrophied, and sexual power may be impaired. The catamenia usually disappear early in the disease. The hair does not fall out, but is often coarse and rough; it may, however, be natural. In some instances, particularly when cachexia is present, the muscles are wasted and feeble. On the other hand, a marked

increase in muscular power has been occasionally noted. It is stated by Erb that the muscles respond more readily to electricity than in health. In the spine there is often great exaggeration of the dorsal curve with compensatory lordosis in the lumbar part. The thorax undergoes increase in the antero-posterior direction, with marked lateral flattening. The clavicles, ribs, and sternum are frequently hypertrophied. Erb has called attention to an area of dulness over the manubrium, which he believes to be due to an enlarged thymus, but this has not been constantly noted. The thyroid gland has very commonly presented some abnormality, in some cases being apparently atrophied, in others much enlarged. The laryngeal cartilages may be hypertrophied. Partly on this account, and partly in consequence of the hypertrophied tongue, the voice becomes thick and deep-toned, though quite distinct. There is frequently enlargement of the joints, not due to changes in the synovial membrane or cartilage, but to hypertrophy of the ends of the bone and to the development of exostoses. The shafts of the long bones are but little affected, and never present the characters of osteitis deformans. The pelvic bones sometimes become enlarged, and the cavity of the pelvis increased in size. A tendency to varicose veins and hæmorrhoids has been described, but no other abnormality of vessels has been detected. Marie asserts that the heart is sometimes hypertrophied. Detailed observations on the temperature are wanting. Sensations of cold, so common in myxœdema, do not occur. On the other hand, in one case there was a marked intolerance of heat. The mental faculties undergo no impairment, except perhaps in the later stages. Headache, often severe, and pains in the body, especially about the joints, are common. Erb noticed slight impairment of sensation in the hands in one case, but this would appear to be exceptional. Of the special senses, the sight is most frequently affected. Optic neuritis, passing on to atrophy, with associated blindness, has been noted in some cases. The senses of hearing, taste, and smell may be deficient. Voracious appetite, excessive thirst, and an increased quantity of urine have been observed in a few instances. One of the patients suffered from glycosuria.

The duration of the disease may be twenty years or more. The initial

symptoms in many cases are headache and suppression of the catamenia, the changes in the extremities and face occurring very gradually at a later date. In the advanced stages, cachexia supervenes, the patient becomes bedridden, and may remain in this condition for years, finally dying of exhaustion.

Diagnosis.—The disease is most likely to be confounded with myxœdema; but in acromegaly the sudoriparous and sebaceous secretions are not suppressed, the skin does not assume the dry and harsh character seen in myxœdema, the hair undergoes no marked nutritive changes and has no tendency to fall out, and bodily and mental torpor are not present. In myxœdema the bones never undergo hypertrophy, and disease of the optic nerves does not occur. From osteitis deformans acromegaly is especially distinguished by the absence of deforming changes in the shafts of the long bones, by the symmetrical distribution of the hypertrophy, and its limitation in the limbs to the hands and feet, and by the remarkable enlargement of the bones of the face, whereas in osteitis deformans the cranium is mainly or exclusively hypertrophied. Marie points out that in osteitis deformans the face is triangular with the base upwards; in acromegaly it is egg-shaped with the large end downwards, and in myxœdema it is round like the full moon. From leontiasis ossea and rheumatoid arthritis there are many and obvious points of difference, on which it is unnecessary to dwell.

Prognosis.—This has been already indicated in the description of the disease. It is sufficient here to say that there may be prolonged stationary periods, and that occasionally the disease undergoes temporary recession.

Morbid Anatomy and Pathology.—Six cases have been examined after death—viz., those of Henrot, Fritsche and Klebs, Brigidi, Marie and Broca, Fraentzel (mentioned by Virchow), and Saundby. In four of these six cases there was marked enlargement of the pituitary body, apparently a simple hypertrophy. Of the two other cases, in which this body was said to be normal, one, by Fraentzel, is believed by Marie to be a doubtful example of acromegaly; the other, by Saundby, is exceptional in the fact that the entire duration of the disease was only six months. Saundby describes atrophy of the thyroid gland with interstitial change, whereas in Henrot's case there was marked hypertro-

ply, and in Fraentzel's doubtful case this body was normal. Among other changes must be mentioned simple hypertrophy of the thymus (Fritsche and Klebs) and of the ganglia and cord of the entire sympathetic, as well as of the brachial plexus and several cranial nerves (Henrot). The changes in the skeleton were well described by Henrot, and recently have been given in great detail by Broca. According to the latter the spongy parts of the bones become hypertrophied, their porosity is exaggerated, and their nutrient foramina enlarged. Bony outgrowths are found around the articular margins, and also where there is normally any prominence, as, for example, at the points of attachment of the ligaments and tendons. The grooves in bones for the passage of vessels become extremely large. The lumbar vertebrae show the same hypertrophy of the spongy part, and in the dorsal region there is scoliosis with kyphosis. The enlargement of the face is mainly due to dilatation of the antrum. The mastoid cells and other sinuses are similarly affected. The actual cause of acromegaly must for the present be considered obscure. The scanty information derived from post-mortem examination seems to indicate that the affection depends on disease of the pituitary body. Such an assumption must be entertained reservedly, since it is possible that the hypertrophy of the pituitary, as well as of the thyroid gland and of the sympathetic, might be really local excesses of growth having no share in causation, but being simply constituent parts of the disease. Virchow discusses at great length the relation between acromegaly and various forms of local hypertrophy. He points out that it is difficult to draw a sharp line of distinction between them, but nevertheless he believes that acromegaly is an independent disorder, characterized especially by abnormal process of growth of the distal parts of the upper and lower extremities. Between this form of partial giant-growth and universal giant-growth there are many points of similarity; but there exists this important point of difference—that the former is a disease, whereas the latter is simply an unusual over-development of the normal process.

Ætiology.—The actual cause is unknown. Both sexes are affected in about equal proportion, and the disease may occur at any period between the ages of fifteen and sixty. Heredity is believed by Virchow to have an important share in

causation. In several cases there was an early cessation of the catamenia, but this was probably a symptom of the disease. Acromegaly occasionally occurs about the period of puberty, and this fact, together with the early arrest of the catamenia, has led some observers to the gratuitous assumption that the disease has some relation with the sexual processes or changes in the sexual development.

Treatment.—Treatment is to be conducted on general principles. Massage is favourably mentioned by one observer.

W. B. HADDEN.

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ACTINOMYCOSIS is the name given by Bollinger,¹ at the suggestion of the botanist Harz, to a disease which is of frequent occurrence in cattle. A similar, if not identical, disease has been recognized in man.²

The name is derived from the presence of a characteristic micro-parasite, *the ray fungus*, which is found in the affected tissues.

FIG. 1.

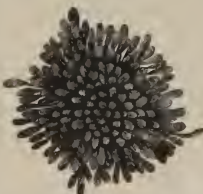


FIG. 2.



Actinomyces, showing—

Fig. 1. Clubs, as usually found in cattle.

Fig. 2. Method of spreading (low power).

FIG. 3.

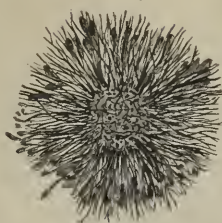


FIG. 3. Threads, as usually found in man (highly magnified).

Its manifestations are essentially those of chronic inflammation, with or without suppuration, often resulting in the formation of granulation tumours.

The disease cannot with certainty be recognized except by the detection of the fungus in the discharges, or in the substance of the infected part, although in many cases the peculiar structure of the tumours has given the clue to a correct diagnosis.³ The symptoms depend more on the locality of the tumours than on the nature of the organism.

This disease has not unreasonably been mistaken for many other affections, such as tubercle, osteo-sarcoma, strumous abscess, &c., the organism having in most cases been overlooked. Not however in all, for Langenbeck operated on a case in 1845, and Lebert⁴ in 1857 and Robin⁵ in 1871 gave figures of the organism, without recognizing the true nature of the disease.

It was not until 1876 that Bollinger¹ threw new light upon the subject by showing that many of the tumours which are common in cattle are in reality caused by the presence of a definite organism. In 1877 Israel² published observations on a similar disorder in man. It was not, however, until 1879 that Ponfick⁶ insisted on the identity of the organism found in man with that found in cattle. This statement was accepted without definite proof, and much confusion has been caused by descriptions of the organisms found in man being taken from specimens of actinomycosis bovis.

The history of the affection is nowhere better given, in English, than in Professor Crookshank's valuable Appendix to the Report of the Agricultural Department of the Privy Council for 1888, to which the writer is indebted for much information and for many references.⁷

The first case in this country was recognized by the writer, in conjunction with Dr. Sharkey, when investigating

the microscopic appearances of an abscess of the liver. Considerable light has been thrown on the structure of the growth by these researches, and the observations have been amply confirmed in this country and in Germany. They tend to show that in most cases the organism in man differs from that found in actinomycosis bovis, and help to confirm the accuracy of Israel's original drawings. It is probable that the organism is polymorphic, and that, although the forms are different, the fungus is the same under different conditions of growth. Dr. Crookshank's inoculation experiments are in support of this view: and intermediate stages have been found by Delépine, Eve, and Macfadyan,⁸ whose observations fill up the gaps hitherto existing in the chain of evidence which connects the various forms found in cattle with those found in man.

The fungus grows embedded in the tissues or floating in the pus. In the latter are seen minute spherical granules, varying in size from a small pin's head downwards. The granules appear sulphur-yellow by reflected, and greenish-yellow by transmitted light, and in the discharge from a tumour which is suppurating freely are often very numerous.

These granules consist of masses of the fungus from which the disease has received its name, together with degenerated inflammatory products.

When looked at under the microscope with a low power, and by reflected light, they closely resemble a minute raspberry. They have a rough, granular surface, which superficially seems to be composed entirely of club-shaped bodies radiating from a common centre. With a higher power, and after the action of reagents such as benzole and caustic potash, much of the intervening fatty debris is dissolved away, and it is seen that the spherule consists of a central core of fine mycelial threads, with a varying number of club-shaped bodies radiating from it. Some of the clubs consist of segmented rods with bulbous extremities, some are digitate, some palmate. The connection between the clubs and the threads has been minutely investigated by Crookshank and Taylor, who find that the clubs consist of an external sheath continuous with, and an expansion of, the protoplasm of the thread, which runs up into and constitutes at its termination the central core of the club. These observations have been confirmed by Delépine. Amongst

the threads there are often found minute spherical bodies which are supposed to be spores. The number of clubs varies greatly in different specimens: in some the growths seem to consist almost entirely of threads,⁹ in others of clubs,¹⁰ though in all cases clubs and threads have been ultimately detected; but the reactions seem not to be identical with those given by actinomycosis bovis.

There is much doubt as to the true nature of the growth; it has been generally accepted in Germany that it is a bacterium,¹¹ and that the club-shaped bodies are only degenerative forms.⁸ This is contrary to analogy, and is, it would seem, founded on the result of imperfect cultivation experiments.¹² There can be little doubt that it is a mould, that the threads are delicate hyphæ forming a dense mycelium, and that the clubs are organs of fructification analogous to the asci of ascomycetes (Delépine).

The best mode of staining the threads is by Gram's method:—Saturated alcoholic solution of gentian violet 10 per cent. in aniline water decolorized in solution of iodine 1 part, iodide of potassium 2 parts, water 300 parts, and then in alcohol. To stain the clubs as found in man is difficult; the best results have been obtained with orange rubine or eosin.

Morbid Anatomy.—The appearances presented by the tumours vary according to the structure of the tissues primarily attacked. It is remarkable that in most of the cases recorded in England the liver has been affected, and has seemed to be the primary point of infection. In this organ the structure of the growth is very characteristic (an excellent engraving is given by Mr. Shattock in the St. Thomas's Hospital Reports, vol. xv., 1885, p. 235). It consists of minute foci of inflammation, which tend to run together, forming larger areas. These again unite, forming small abscess cavities filled with thick creamy pus, separated from each other by dense bands of fibrous tissue. By this process, as it extends, the disease slowly destroys the proper tissue of the affected part, and replaces it by a sponge-like mass of interlacing fibrous bands filled with pus, the amount of pus being greater in proportion as the course of the disease is rapid.

In the extremely chronic example of the disease seen in the tongues of cattle (wooden tongue) the growth consists almost entirely of fibrous tissue,

embedded in which are minute specks of inflammation, the organism being the central spot of each inflammatory area.

In the softer and more rapidly extending growths, such as occur in the thorax, masses of the fungus are found floating in a pultaceous mass of pus, mixed with products of inflammatory degeneration.

If very chronic, the tumours may become calcified, or even partly converted into bone.

The disease spreads by the formation of secondary foci of inflammation caused by the transportation of the fungus.

Nothing certain is known of the communicability of the disease from cattle to man, and the origin of the disease itself is doubtful.

Treatment.—No drug is known to exert any specific influence on the organism. Removal of the infected tissue is the only method which holds out any chance of ultimate success. If the main growth can be removed, there is hope of complete recovery.

T. D. ACLAND.

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ADDISON'S DISEASE is characterized clinically by a progressive asthenia with a great liability to nausea and vomiting, and usually, if not always, by a peculiar discoloration of the skin.

Symptoms.—The onset of the disease is almost invariably gradual. Sometimes the discoloration is the first thing noticed, but in the majority of cases, at

any rate, an increasing debility will have already set in. The patient, though often anæmic, is not necessarily so to any marked degree, and, though there may be wasting, there is not, as a rule, great emaciation. The extreme weakness, for which no sufficient signs of organic disease can be found, is the chief feature of the early stages. The heart-sounds are clear but weak, the pulse small and frequent, and the patient suffers from breathlessness, cold extremities, and a tendency to faintness. He has a downcast, sad look, and constantly complains of weariness; the nervous enfeeblement affects the mind as well as the body. Anorexia, nausea, and vomiting are generally present; they usually appear early in the disease, and recur at intervals. The bowels are sometimes confined, sometimes relaxed, and that without any obvious cause; the urine is pale and free from albumen, and may be increased in quantity. As a rule, the temperature is below the normal. Amongst other symptoms, more or less pain in the loins and epigastrium, vertigo, tinnitus, and headache are often present. The discoloration or bronzing of the skin, as it has rather erroneously been called, is probably not an essential feature, but it is found in a large majority of the cases. It is due to an increase in the normal amount of pigmentation, and even when most extensive, and affecting the whole body, is never uniform throughout, except in places where the skin has suffered injury or abrasion, as from recent blistering; but no sharp lines of demarcation will be found. The change occurs in small patches or diffused areas, varying in colour from a light yellow or greenish brown to a slaty blue-black shade or deep olive tint. It is usually first seen on the face; and here, and on the neck, and backs of the hands—*i.e.*, in the exposed regions of the body—it is most marked. It is merely an exaggeration of the normal pigment of the part, and is therefore very marked on the penis and scrotum and about the nipples. It is also seen on the parts subjected to friction—*e.g.*, the site of the garters. Scars that are not very deep and places where blisters have been applied are apt to become highly pigmented. The sclerotics are always pearly white, in strong contrast to the rest of the patient's face; the nails, hair, and teeth may show increased pigmentation, and in one case an increase of pigment was found in the pia mater. Fagge surmises that if persons were kept in the dark or not exposed

to sunlight, even if suffering from this disease, they would remain pale. Here and there on the body a few small spots like pigmented moles will be seen. The mucous membranes may also be affected, and patches may be found on the lips, palate, cheeks, sides and under-surface of the tongue, and in the vagina. The intensity of the colour may vary with the patient's general health, and leucoderma may co-exist. The disease progresses, but not always at a uniform rate, to a fatal termination. The prostration increases so that the patient is confined to bed or to the recumbent position, from which he cannot move without great risk of syncope; his voice becomes weak, and he is constantly sighing or yawning or troubled with hiccough. The intellect gradually becomes dulled, and delirium, coma, and convulsions usher in the termination, or the patient is carried off by incoercible vomiting and diarrhoea. In a considerable number of cases death occurs suddenly from syncope during some slight exertion. It is believed that the disease is invariably fatal, and there is evidence that the cases in which no discoloration is observed run the shortest course. There may be periods of remission, and the illness may be prolonged for a few years, but it usually terminates in about eighteen months.

The *diagnosis* is always difficult, especially in the early stages, when discoloration is slight or absent, and it is probable that some of the fatal cases of so-called nostalgia which have been recorded were, in reality, instances of this disease. Where the asthenia and pigmentation are both well marked, there need not be much hesitation in pronouncing an opinion, but it must be remembered that pigmentation is met with in abdominal cancer and tuberculosis, lymphoma, pregnancy, chronic uterine disease, hepatic disorders, and melanotic cancer.

Pathology.—An increase of pigment is found in the cells of the rete mucosum, chiefly in the lower layers; also in the deeper parts of the connective tissue, the cells of the papillæ, and in the subcutaneous tissues. It is said that this pigment contains no iron, thus differing from the normal pigment. It is elaborated in the deeper cells about the vessels of the corium, from whence it passes to the more superficial layers. Chronic phthisis or general tuberculosis will often be found; the heart is sometimes small, and the spleen occasionally enlarged; but the chief interest centres round the suprarenal bodies and adjacent structures.

The commonest change, and one that for a long time was believed to be essential, is a caseo-fibrous one, whereby the capsules are enlarged, though retaining their normal shape, and are adherent to the structures in their immediate neighbourhood. In this state they are firm or indurated, and on section show greyish-white or caseous nodules of various sizes, the rest of the organ presenting a semi-translucent, greyish aspect; or the whole may have undergone caseation; the caseous areas may be softened into a creamy material or may have become calcareous. When this latter process has not occurred, the final stage is one of absorption, the capsule shrinking into a small, puckered, fibrous mass, adherent to the structures round it, being then much smaller than normal and recognized only with difficulty. Fagge describes the earliest change as the formation in the medullary part of a firm grey or whitish mass more or less nodulated at the growing edge, with clusters of bodies like miliary tubercles round it. This spreads into and destroys the cortical part, an enlarged, hard, uniformly greyish mass resulting. The next stage is that of caseation. Microscopically, at the commencement small, round, lymphoid cells are seen in the meshes of a delicate, wavy, fibrillated stroma; the subsequent appearances are those always present in tuberculosis. Tubercle bacilli have been demonstrated to be present. Some undoubted cases of this disease, however, have been recorded in which the supra-renal bodies had not undergone this change, but were found atrophied either from interstitial changes or apparently from mere wasting. Other diseases of the capsules, such as cancer, are probably never followed by the special symptoms of this disease. Amongst the structures to which the capsules are sometimes adherent are the semilunar ganglia and the plexus of nerves in connection therewith, and sclerotic changes have sometimes been found in these, the nerve cells being deeply pigmented, whilst both fibres and nerve cells may be compressed and ultimately destroyed by the growth of connective tissue taking place between them. The examination of these parts is often a matter of some difficulty, and requires to be conducted with the greatest care. After removal of the intestines it is usually considered the best plan to remove the liver, kidneys, supra-renal capsules, ganglia, &c., *en masse*, and afterwards to dissect them from behind; if

great care be not taken, the very existence of the capsules may be overlooked, owing to the extreme wasting.

Etiology.—The causes of the disease are unknown. It is much more common in males than in females, and is most often met with between the ages of twenty and forty; it is very rare in children under ten, or in persons over fifty. It is more common amongst the working classes than amongst the well-to-do, possibly because the former are much more exposed to injury, as it has sometimes seemed to follow upon an injury to the abdomen or back, and in not a few cases it has been associated with caries of the spine. It is not, strictly speaking, an hereditary affection, nor, though it is frequently dependent upon tubercular disease, is it more common amongst phthisical families. No theory as to the nature of Addison's disease which satisfactorily meets all the difficulties has yet been framed, and during late years pathological opinion has wavered between the view that the changes in the capsules are primary and all important, and that which regards these as secondary to an inflammatory condition of the neighbouring sympathetic nerves and ganglia; but at the present time the balance of authority is strongly in favour of the theory that the disease is primary in the adrenals, and that the changes found therein are due to the presence of tubercle.

Treatment.—There is no specific against this malady, nor is any drug known to have ever exercised any influence over its course, although there is often a remission of urgent symptoms for considerable periods; the treatment, therefore, can only be symptomatic. The patient should be warned of the liability to syncope, and in the late stages should be strictly confined to the recumbent position. The diet should be most carefully regulated (remembering that vomiting and diarrhoea are very apt to occur and difficult to check), and the strength maintained by such general tonics as may seem indicated.

JOHN ABERCROMBIE.

ADENOID VEGETATIONS, a term applied to hypertrophy of the adenoid tissue, normally existing in the nasopharynx, to which the name of Luschka's tonsil has been given.

Symptoms.—In a characteristic case the symptoms are so marked that they are at once recognized by the practised observer. The points which most attract attention

are the vacant expression of the child, the open mouth, and usually somewhat noisy breathing. The face is elongated, and the nose narrow. It will probably be found that the patient's hearing is more or less impaired, and that at times he suffers from an increased amount of deafness, accompanied by earache and discharge from the ears. The child usually suffers also from a hacking cough, is very subject to attacks of cold in the head and laryngeal and bronchial catarrh, snores at night, and mucus tinged with blood will often be found staining the pillow in the morning. Over and above the appearance of stupidity, produced by the mouth being kept habitually half-open, and the deafness, there is no doubt that the existence of these growths does influence unfavourably the mental condition and lead to a want of the power of application. When the child talks the voice has a muffled character, the so-called "deadness of speech," with inability to pronounce the nasal consonants *m* and *n*. Enlarged tonsils and granulations at the back of the pharynx are often found associated with adenoid vegetations. Owing to the constant secretion kept up by the presence of these growths, a muco-purulent discharge will be seen trickling down the pharynx. If a rhinoscopic examination is practicable, the naso-pharynx will be found more or less occupied by these growths, so that the normal outlines of the septum and choanæ are obscured. If the examination by means of the mirror fails to give satisfactory information, a digital investigation may be made, and, on introducing the finger behind the soft palate, the vegetations may be recognized by the touch: if small, they have a velvety feel; if larger, they impart the sensation of a bag of worms. On account of their vascularity, there is usually blood on the finger when it is withdrawn. Adenoid vegetations are often associated with a lateral narrowing of the alveolar arch and prominence of the upper incisor teeth, and their presence exercises an unfavourable influence on the development of the chest, which becomes pigeon-breasted. Hernia has recently been attributed to nasal stenosis, the frequent and long-continued efforts on the part of the patient to get rid of the secretion from the nasal passages giving rise to increased abdominal pressure. That adenoid vegetations exert an injurious influence on the physical development of children is shown by the rapid increase in height and weight which follows

their removal by operation. The writer is in the habit of noting down the height and weight of patients before and after operation, and he has been much struck by the alteration experienced, especially in the case of children who had previously been stunted in growth.

Pathology.—Adenoid vegetations precisely resemble in their structure enlarged tonsils and the granulations seen in the posterior wall of the pharynx.

Ætiology.—Youth is the most important predisposing cause, as with advancing years the growths have a natural tendency to shrivel up and disappear, but, too often, not before they have done grave and permanent damage. They are met with in all classes of life and in all climates, but they occur especially in temperate and moist climates. Some authors regard them as an outcome of the scrofulous diathesis, but this view requires further corroboration.

Treatment.—Too much stress cannot be laid on the importance of the early and complete removal of these growths, and on the folly of waiting for their spontaneous disappearance. Between the ages of four and twelve is the best time for the operation, but the writer has seen good results in patients of fifteen and sixteen. Older patients derive much less benefit from operation, as in them permanent changes have probably already taken place as the result of the presence of these vegetations. Various methods of removal have been suggested, but the writer is of opinion that the most satisfactory method is to place the patient under chloroform, and to thoroughly clear out the naso-pharynx at one sitting by means of Loewenberg's forceps. This procedure has the advantage of allowing the tonsils to be excised at the time if, as is so frequently the case, they are enlarged, and, if need be, portions of the inferior turbinated bodies may also be removed. For full details of the operation the reader is referred to an able article by Butlin in vol. xxi. of St. Bartholomew's Hospital Reports.

F. DE HAVILLAND HALL.

AGORAPHOBIA, a fear of open places.—This symptom, first described by Beard, occurs, usually in association with others of greater importance, in cases of neurasthenia and in persons of neurotic inheritance. The fear seizes the patient indifferently in a large crowded square of a town or upon a lonely plain. The dread which many people have of looking down from a height is a strictly

parallel psychical state. Agoraphobia is comparable to some sensations of the insane, such as that of the body growing too large for the room, shrivelling, or becoming buoyant.

AIR, COMPRESSED, Therapeutics of.—Several forms of apparatus have been devised for the purpose of inhaling compressed air, the most practical being constructed upon the principle of the gasometer (Waldenburg's), or upon that of the accordion. In either of these the pressure can be regulated with some degree of precision, and is under the control of the patient. A more complete method of inhaling compressed air is by means of the compressed-air bath. These baths are to be found at several places on the Continent, and have been much used. In this country there is one at the Brompton Hospital for Consumption (where, also, a pneumatic cabinet, mounted on strong wheels and arranged for use, either with compressed or rarefied air, has recently been introduced), and a few others at Ben Rhydding and other health resorts, but their use has not as yet become general. They consist essentially of small iron chambers, capable of holding from one to four persons, and rendered completely air-tight. Air is forced in at the lower part of the chamber and allowed to escape through a graduated outlet at the roof, the degree of pressure being carefully regulated by this means. A compressed-air bath should last about two hours, the pressure, which may range between 2 and 10 lb., being increased very gradually at first, until it reaches the maximum that is required, and, when this degree of pressure has been retained for about one hour, it should be as gradually diminished, till the normal atmospheric pressure is again reached. The effect of compressed air upon the lungs, by whichever method it be inhaled, is to cause greater depth of inspiration, and consequently greater expansion of the lung tissue. The number of respirations per minute becomes slower. The heart's action also is slowed by several beats, and the arterial tension is very considerably increased. The chief physiological action is the introduction of a larger proportion of oxygen with each inspiration, and hence the induction of more rapid tissue changes. The cases most suitable for treatment by this method are chronic inflammatory conditions which have been followed by collapse of lung tissue or temporary

closure of bronchioles. By some observers the compressed air is said to have a direct sedative action upon the respiratory passages, and so to be of value in cases of asthmatic dyspnoea. In all conditions, its effects are in the first instance temporary only, and the forced expansion of the lung is not maintained. After prolonged use of the bath, however, a more or less permanent expansion is gradually induced, which is accompanied by marked relief to the dyspnoea, but to obtain such a result, upwards of a hundred baths are sometimes necessary. The temporary relief in some cases of chronic bronchitis and emphysema, or of the latter condition without any inflammatory change, is very decided. In cases of chronic pleurisy, where the lung has become bound down and partly disused and collapsed, the force of compressed air may be advantageously employed to re-open as much of the shrunken tissue as may be capable of re-expansion, and in certain cases of imperfect recovery after acute pneumonia it may have a beneficial effect. In cases of phthisis compressed air must be used with caution. It would appear to be most efficacious in those cases where the disease is not active, and where there is but little evidence of any inflammatory condition of the mucous membrane. It should not be used where there is any tendency to hæmorrhage, or where the disease appears to be progressing rapidly. The treatment is contra-indicated in all cases of marked arterial degeneration from whatever cause, and in all cases where there is any reason to anticipate hæmorrhage from any of the internal organs, as the stomach, uterus, kidney, &c. Compressed air is not suitable for old persons, nor for those in whom the chest-walls have become rigid.

E. C. BEALE.

AIR, RAREFIED, Therapeutics of.—Rarefied air may be employed as a remedial agent either by means of apparatus similar in construction to that used for the inhalation of compressed air, or by a residence at high altitudes in some of the mountain health resorts. Its immediate effect upon the function of respiration is to increase the muscular efforts required to fill the chest, and by this increased effort a certain amount of lung tissue becomes re-expanded which in ordinary shallow breathing has been allowed to remain at rest, and perhaps collapsed; the expiratory movements at the same time are more

complete, and the average of residual air and carbonic acid left in the lungs after each respiration is less than before. By this means, therefore, an increased degree of tissue change is induced, and, when the treatment is persevered with for a long period, the lungs themselves tend to become more or less permanently increased in capacity. Various methods have been tried whereby the inhalation of compressed air might be so combined with expiration into rarefied air as to increase still further this mechanical expansion of the lungs, but hitherto the results obtained have not been satisfactory enough to warrant the adoption of the method as a regular method of treatment. Expiration into rarefied air has, however, been found to be beneficial to certain cases of emphysema by assisting the more complete emptying of the chest of the regular tidal air and of some of the residual carbonic acid, which is rendered difficult in that disease by the loss of elasticity of the vesicular tissue.

E. C. BEALE.

ALBINISMUS is the congenital absence of pigment from the skin, hair, choroids and irides. The condition is frequently hereditary and generally affects more than one member of the same family. The hair is usually white, fine, and silky, but occasionally its colour is reddish. Photophobia and nystagmus are usually present; the iris appears pink, and the pupil has a dark-red spot in its centre. Albinos are frequently poorly developed, both mentally and physically, but the rule is by no means an invariable one. Partial albinismus is fairly common among negroes, giving them a "piebald" appearance. The patches occasionally occupy the area of distribution of some nerve; the eyes are usually unaffected. Some cases are said to recover.

ALBUMINOID DISEASE is also known as waxy, amyloid, or lardaceous infiltration or degeneration. It is a peculiar change, usually affecting several of the viscera at the same time, and supervening upon, and in consequence of, some pre-existing disease. The spleen, liver, kidneys, intestine, and lymphatic glands are the organs most frequently affected, and in the order named. The first result is to produce an increase in size of the organ, which is pale, and, on section, presents a glistening, waxy, bacon-like appearance. The change always commences in, or in connection

with, the capillary vessels. In the spleen it is first seen, and is most marked in the Malpighian bodies, which become visible to the unaided eye, looking like grains of boiled sago, whence comes the term "sago-spleen." In the liver the change commences in the hepatic capillaries, and consequently first affects the intermediate zone in each lobule. The liver cells are not infiltrated. In the kidney it is often confined to the glomeruli, or some of the afferent arteries may also be affected. Occasionally the cortex escapes, and the straight vessels in the pyramids are invaded. Not infrequently albuminoid disease of the kidney is accompanied by some other form of chronic renal mischief. In the small intestine the blood-vessels of the villi show infiltration. The change is found less often in the stomach, and still less frequently in the large intestine. Albuminoid deposit has also been found in the pancreas, supra-renals, in the skin, in certain new formations, and in the endothelial lining of the aorta. In a few instances renal casts have given reactions characteristic of this change. In the later stages the organs may be found so enormously enlarged that the liver, for example, almost fills the abdominal cavity, and the spleen may reach a hand's breadth below the costal margin. If the cause of the disease be removed, the infiltration may be absorbed, the affected organs returning to the normal size. The *iodine test* for the lardaceous change is easy of application, and reliable. The cut surface of the organ having been rendered free from blood by washing, a solution of iodine, alone or with iodide of potassium, is poured over it, when the affected parts will become of a deep mahogany-brown colour, the degree of staining depending upon the amount of disease. This test can be applied to a section under the microscope in a doubtful case, or the following microscopical test may be used:—The section is stained with methyl-aniline violet, and mounted in glycerine, acidulated with acetic acid; the affected parts take the stain very readily, and the addition of acetic acid turns the parts so stained a bluish-violet colour. Whether the albuminoid change be of the nature of an infiltration from the blood or a primary degeneration is a point on which there has been much dispute, and which even now is not finally settled. On the one hand, it is contended that in this disease there has been a deposition of the fibrin or albumen of the blood modified by the loss of alkali or the addition

of an acid—that lardacein is, in fact, nothing more than de-alkalized fibrin (Dickinson); whilst, on the other hand, it is pointed out that de-alkalized fibrin is really syntonin, and that nothing like lardacein has ever been discovered in the blood, and cannot, therefore, have been deposited from it.

Ætiology.—The conditions under which the change occurs are in cases of chronic suppuration secondary to bone or joint disease; also of phthisis, empyema, pyelitis, ulceration of the skin; of syphilis with or without bone disease or suppuration; it is said that congenital syphilis alone may be a cause. Other causes have been named, such as malaria, malignant growths, &c., but more evidence is required on this head. Very little is known as to the length of time required for the production of the disease; much depends upon the severity of the original affection.

As a rule, the change appears in several of the viscera about the same time, and a *diagnosis* would be justified by the simultaneous occurrence of a smooth enlargement of the liver and spleen, unaccompanied by jaundice or ascites, together with albuminuria, diarrhoea, and a waxy cachectic complexion. As has been already stated, other forms of Bright's disease may co-exist, so that the signs of a chronic nephritis should not exclude the diagnosis of albuminoid disease.

Treatment.—In the syphilitic cases it would be always worth while to give iodide of potassium and mercury a trial, and examples of apparently complete recovery have been recorded. In the other cases, good food, pure air, iron, cod-liver oil, and quinine are the most important remedial measures, and perhaps the salts of potassium might be beneficial. The removal of the cause, if it be possible, is the only reliable means of arresting the disease.

ALBUMINURIA.—Various forms of albuminous matter are at times found in pathological urines, but that which clinically is known as albumin is a mixture of serum albumin and serum globulin in various proportions. In behaviour to the ordinary tests these are identical, and for practical purposes are detected and estimated as one body.

TESTS FOR ALBUMEN.—*Heat.*—Generally speaking an acid albuminous urine, when boiled, becomes turbid, from the coagulation of the albumen, and the turbidity does not disappear when a few drops of acid are added. This when

properly carried out, constitutes one of the most delicate tests for albumen. The urine should be clear, or, if not so, should be filtered. A turbidity from the presence of urates does not interfere much with the reaction, since such turbidity will disappear at a temperature below that required to coagulate the albumen. The proper acidity of the urine is of the greatest importance. In an alkaline urine the albumen tends to become alkali-albumen, which is not coagulated by heat. Moreover, in such urine the phosphates are deposited on heating, although afterwards dissolved by the addition of acid (*see PHOSPHATES IN THE URINE*). Similarly in a too-acid urine, a small quantity of albumen may be changed into acid albumen, and again become non-coagulable by heat. A most common error arises from this fallacy, in that a test-tube, imperfectly cleaned, may contain a sufficient amount of nitric acid to acidify its contents and prevent coagulation. The test should be carried out thus:—A tube, some 6 inches in length, should be filled to about two-thirds of its length with the urine to be examined. The reaction of the urine being ascertained, it should be rendered neutral by the addition of either dilute acetic acid or of liquor potassæ, as may be required. Dilute acetic acid is now to be added until the reaction is faintly acid, and then still one drop more of the acid. The test-tube being held by its *lower* part, the *upper* part of the column of urine is boiled over a flame; the albumen, if contained therein, is shown as a white cloud, which is the more easily seen when the upper part of the column of urine is contrasted with the lower and unboiled portion. As additional security, a few drops more of acetic acid may be now poured in to dissolve any phosphates which might possibly have been precipitated. As is seen, there are very many fallacies in connection with this test, and the following is generally preferable.

Nitric Acid.—Nitric acid coagulates albumen. The best method of applying this reaction clinically is to pour a little fuming nitric acid into a test-tube, and then, inclining the tube as much as possible, allow the urine to flow gently down the side, so as to float on the surface of the denser acid to the height of about an inch. At the line of junction of the two fluids, the albumen, if present, is coagulated, forming a white ring, which, if only a small quantity be pre-

sent, may not appear for some fifteen or more minutes. Frequently, immediately above the albumen ring, is seen a more hazy zone, believed to consist of mucin, though this is doubted by the writer. This ring disappears if the tube be slightly shaken. Urine containing large quantities of urates will precipitate them on the addition of the acid; but the cloud thereby produced is usually first seen at the top of the urine column, and disappears when the urine is warmed. Similarly, copaiba and cubebs, if taken internally, appear in the urine and are precipitated by the acid; but these again disappear on the application of slight heat. A coloured ring is very frequently seen at the junction of the acid and the urine, and may hinder the recognition of the albumen cloud. Such a ring appears in urines which contain an excessive amount of indican or skatol absorbed from the intestine, and in the urine of persons who are jaundiced, or who have taken iodides or bromides internally.

In the opinion of the writer the best test for albumen in the urine is the *magnesium-nitric test*, recommended by Sir William Roberts, and not to be confused with the acidulated-brine test of the same observer. The magnesium-nitric test is made by mixing one part of strong nitric acid with five parts of a saturated solution of sulphate of magnesium. It is applied in exactly the same way as the nitric-acid test. Its advantages over the ordinary nitric-acid test are that it is more delicate, the albumen ring being denser and appearing more rapidly, whilst the fluid used is not so corrosive.

Picric Acid.—A saturated solution of picric acid constitutes, when used with care, a very delicate test for albumen. It may be applied by the contact method, as described above, though it is much more difficult to keep the two fluids separate than in the case of the nitric-acid tests. Picric acid also throws down peptones, albumose, mucin, and quinine, but the clouds produced by the precipitation of these bodies are removed by heat.

A large number of other coagulation tests for albumen have been put forward in recent years, among which may be specially mentioned acidulated brine, ferrocyanide of potassium, tungstate of soda, and potassio-mercuric iodide. All of these are extremely sensitive, but are prone to give indications of the presence of albumen in what are normal urines. A convenient method of applying some

of them is by means of Dr. Oliver's test papers (see his "Bedside Urine Testing").

To separate serum globulin from serum albumin the urine should be neutralized, and a large quantity of solid magnesium sulphate added to it. The mixture is then to be allowed to stand for some hours—best at a temperature of about 35° C. The globulin is thus precipitated, and its separation is hastened and rendered more complete if the mixture be repeatedly shaken. It is to be noted that the globulin is precipitated, not coagulated, and it can therefore be filtered off and re-dissolved in water, the albumin remaining in the original solution.

QUANTITATIVE ESTIMATION OF ALBUMEN.—The most accurate method of ascertaining the quantity of albumen present in a given fluid is by precipitation and weighing, but this method is so troublesome, and requires so much special technique, as to be useless for clinical purposes.

As a rough method of estimation, a column of the urine may be acidified in a test-tube and thoroughly boiled. The tube is then allowed to stand for a little time until the coagulated albumen has collected at the bottom of the tube. The height of the column of albumen is then compared with the height of the whole column of urine, and expressed as a fractional proportion, such as a half, a quarter, a twelfth, and so forth. The writer finds it not unnecessary to insert a warning that such proportion refers only to the relative heights of the columns of albumen and urine respectively, and not to the actual amount of albumen present in the whole urine.

A similar but much more accurate method is that of Esbach. The urine to be examined is first diluted to a specific gravity of not more than 1010, and, if necessary, should be rendered acid with acetic acid. It is then poured into a special graduated tube up to a line *u*, and to it is added a mixture of equal parts of saturated solutions of picric and citric acids up to a line *r*. The solutions are well mixed, and allowed to stand for twenty-four hours, at the end of which time the coagulated albumen has subsided to the lower portion of the tube, and its height is read off on a graduated scale, which gives the proportion of grammes per litre.

The dilution method was proposed by Sir William Roberts. By this method the albuminous urine is diluted with

water until, when nitric acid is added, it will give an opacity before forty-five seconds have elapsed, but not before thirty seconds. The observer, with a watch before him, adds nitric acid to the urine by means of a pipette, so that the acid sinks to the bottom of the tube. Should the opacity appear before thirty seconds, the urine is diluted with so many times its own bulk of water as will suffice to produce the desired reaction. The quantity of water added is expressed in terms of the original bulk of the urine employed, as degrees of dilution. It is found by actual weighing that each degree of dilution corresponds to 0.0034 per cent., or to 0.0148 grain per fluid ounce. For further details Sir William Roberts's account in his work on "Urinary Diseases" may be referred to.

For Dr. Oliver's method by the use of test-papers, his work on urine testing should be consulted.

ETIOLOGY OF ALBUMINURIA.—Albumen may accidentally reach the urine from the admixture with it of some albuminous fluid, such as pus or blood. This is not true albuminuria, and is readily distinguished from it by the detection of the other elements of the admixed fluid. It must be borne in mind, however, that cases occur in which, although pus be present in the urine, true albuminuria may co-exist, and it is often a matter of importance to determine whether the amount of albumen present is more than would be accounted for by the pus discovered.

The causes of albuminuria may for practical purposes be grouped as follows:—

1. *Organic Disease of the Kidneys.*—From this cause albuminuria is found in acute and chronic Bright's disease, abscess and tumours of the kidney, and inflammation of the kidney spreading to it from the pelvis of the organ. In most cases of diabetic coma albumen is found in the urine, and is probably caused by the changes in the renal epithelium known to exist in this state.

2. *Pyrexia.*—Febrile disorders of all kinds are prone to be accompanied by the presence of a small amount of albumen in the urine, which disappears when the febrile action ceases. This incidental albuminuria is entirely independent of the cause of the pyrexia. It may occur when the fever is due to some local inflammation, just as when it is part of a general zymotic disorder. Nevertheless, during the pyrexia of pneumonia and diphtheria, albuminuria is specially

marked. It is to be distinguished from the more serious albuminuria which is a characteristic of certain specific fevers, such as scarlet fever, and which is due to the supervention of Bright's disease upon the original disorder.

3. *Congestion of the Kidneys.*—The congestion may be active, representing the early stage of an inflammation of the kidneys, or passive, from obstruction to the outflow of blood from the renal vein. Venous congestion may be part of a general obstruction to the venous flow, and may be caused by heart disease of various kinds, emphysema, and intrathoracic tumours. On the other hand its cause may be more local, such as the pressure of tumours within the abdomen, or of ascitic fluid upon the renal veins.

4. *General Anæmia*, if of severe degree.

5. *Pregnancy and the Puerperal State.*—Although not necessarily productive of organic kidney disease, this cause of albuminuria will be fully discussed under the head of BRIGHT'S DISEASE.

6. *Certain General Blood Disorders*, such as purpura, scurvy, and septic conditions, apart from the accompanying pyrexia. In hæmoglobinuria, which is of similar origin, albumen also appears in the urine in large amount.

7. *Lead Poisoning.*—The association of albuminuria with lead-poisoning is well known. In such case it has been proved both clinically and experimentally to be accompanied by such organic disease as is found in the granular kidney of Bright's disease.

8. *Nervous Disorders.*—Grave nervous diseases, such as tetanus, delirium tremens, and cerebral hæmorrhage, are sometimes productive of a temporary albuminuria. A trace of albumen in the urine is frequently observed after an epileptic seizure, and also after mere emotional disturbance. It may be noted here that albuminuria has been experimentally produced by puncture of the floor of the fourth ventricle. Albuminuria of intermittent occurrence has been noticed in cases of Graves' disease.

9. The condition variously known as functional, simple, transient, physiological, or *cyclic albuminuria*, or albuminuria of adolescence. This will receive further mention below.

10. *Various Functional Disorders.*—Dyspepsia, a highly nitrogenous food, such as eggs, used in excessive amount, a prolonged rigor, cold bathing, the inhalation of sewer gas, excessive muscular exertion, and the blowing of wind instru-

ments have been shown to be causes of albuminuria. By whatever cause albuminuria is induced it is subject to the influence of these and other functional disturbances. Thus the albuminuria of chronic Bright's disease is often more pronounced after meals; is governed by the amount and character of the food assumed; is increased by muscular exercise and by the upright posture, while diminished and even caused to disappear by rest in bed.

Cyclic Albuminuria.—The form of albuminuria which is known perhaps the most generally by this name has received great attention in recent years. It is not uncommon to meet with albumen in the urine of persons who appear to be otherwise healthy, or who complain of but slight symptoms of disease. The state of the urine is frequently first discovered during an examination for life insurance. A large majority of the subjects of this condition are young persons of both sexes at about the age of puberty, whence one name for the condition, albuminuria of adolescence. The urine contains as a rule only a small quantity of albumen, but this is not invariably the case. It is, moreover, noted that the conditions mentioned above (section 10) as influencing all albuminurias have more effect in increasing or diminishing the quantity of albumen in this form. Thus the urine may be free from albumen before breakfast, but contain an appreciable quantity after that meal. The upright posture and muscular exertion greatly increase the amount of albumen. Frequently, too, the albumen makes its appearance only at stated times of the day, but regularly at those times, whence also its term "cyclic." The urine is seldom of a specific gravity lower than normal; its colour is sometimes deeper than usual; it may deposit crystals of uric acid or oxalate of lime, and even occasionally a few hyaline casts. The amount of urea contained in the urine is not diminished, but may be increased. Bile salts are said to be increased, and peptones or sugar have been known to alternate in appearance with the albumen. The subjects of the affection may be in apparently robust health, or they may be pale and languid, and suffer from dyspeptic disorders. The writer believes that two separate categories of these cases may be distinguished by a reference to the arterial tension. In one group there is a high arterial tension, as indicated by the condition of the radial pulse, and in such cases it is not uncommon to find a de-

posit of uric acid in the urine. Sometimes the pulse of persons of this class presents the characters of "virtual" tension, where the heart fails to entirely overcome a peripheral resistance. In the second group the pulse is that of low arterial tension, and such persons often suffer from dyspepsia and general want of tone. The nature of cyclic albuminuria is still obscure. It has been variously asserted to be due to changes in the circulation of the kidney, to atony of the vessels and nerves, to a food albuminuria, and to increased destruction of red blood-corpuscles. Probably the first is the correct view in most cases.

Pathology of Albuminuria.—It has been asserted that albumen is a normal constituent of the urine, and that its presence in disease is merely an exaggeration of the normal condition. It is true that some observers have, by evaporating normal urine *in vacuo*, obtained reactions indicating a trace of albuminous matter, but it must be assumed that when albumen is present in an amount discoverable by the reactions given above, it is the result of a pathological process. Two views have been put forward to explain the absence of albumen from normal urine. The one, that of von Wittich, assumes that albumen is actually transuded into the glomerular capsule, but is afterwards re-absorbed by the renal epithelium; the other, that of Heidenheim, which is more generally advocated, being that the albumen of the blood plasma is prevented from reaching the interior of the glomerular capsule by the layer of epithelium which covers the glomerular tuft. This epithelium has a selective secreting power, and normally eliminates water and urinary salts, but keeps back the albuminous matters. Now, an albumen may be present in the blood which is foreign to that fluid, and this is not retained by the glomerular epithelium, but may make its appearance in the urine. It has been thought that peptones, hemi-albumose, egg albumin, various physical modifications of serum albumin, and hæmoglobin may thus obtain access to the urine. This is true in some instances, but the writer is of opinion that the frequency of occurrence of such a process is exaggerated, and that often the modified albumens under discussion are the result of changes which ordinary serum albumin has undergone after being mingled with the urine. Any condition which interferes with the nutrition of the glomerular epithelium, or in certain cases, of the

renal epithelium, causes albuminuria, since the epithelium then no longer retains the blood albumen. Thus, an inflammation of the epithelium, as in parenchymatous and glomerular nephritis, is accompanied by albuminuria. But a mere functional disturbance of the epithelial nutrition will act similarly. Delay of the blood-flow from heart failure or other cause, or possibly irritation of the epithelial layer by the excretion of abnormal matters, will thus disturb its nutrition and allow the albumen to transude. Disturbance of the arterial tension probably acts upon the kidney function indirectly by influencing the circulation of blood through the capillary vessels, and so again causing disorder of the nutrition of the epithelium. Such is a concise, if not complete, account of the main views which are held as to the pathology of albuminuria; it has not been thought desirable in a practical treatise to enter into fuller details upon a theoretical question.

PROGNOSIS OF ALBUMINURIA.—Albuminuria being only a symptom, its prognosis must be the same as that of its cause. If the latter be functional, the prognosis is usually good; if organic, it is bad. The greater the quantity of albumen passed in twenty-four hours the more likely is the cause to be organic. A persistently low specific gravity of the urine and a deposit of granular, epithelial, or fatty casts are positive signs of organic kidney mischief. A few hyaline casts may be found in functional disorders, but a large number of them is indicative of more serious trouble. The writer has occasionally found that the form of albumen present in slight and unimportant albuminurias was entirely serum globulin, without admixture of serum albumin. This phenomenon, however, is not sufficiently common to be of clinical utility. The long persistence of an albuminuria is of grave omen. The prognosis of cyclic albuminuria is still in dispute. Some assert that it is of no moment; others, that it is liable to lead to organic kidney disease. Long and extensive experience is necessary to determine the latter point. The writer is of opinion that albuminuria, even when of undoubtedly functional origin, should always be considered as a diseased condition, and for purposes of life insurance be taxed, in spite of the otherwise healthy state of the system.

TREATMENT.—Like the prognosis, the treatment of albuminuria depends upon its cause. In the presence of organic

disease the symptom itself rarely requires separate attention, but this will be considered in the section on BRIGHT'S DISEASE. The writer recommends for each of the two varieties of cyclic albuminuria a different treatment. The cases in which there is high arterial tension are best treated by alkalis (such as the tartrate of soda and potash, the sulphate and phosphate of soda, or the acetate of potash) and by fairly free purgation by salines, with the occasional use of a mercurial pill. Those in which there is low arterial tension require the mineral acids, strychnine, and sometimes iron.

PEPTONURIA.—Peptones are detected in the urine by the following test:—Liquor potassæ is poured into a test-tube to the height of nearly an inch, and to it is added one or two drops of a solution of sulphate of copper, so as to make a fluid having the faintest possible blue colour. On the surface of this the urine is allowed to flow gently. A purple ring at the junction of the two fluids indicates the presence of peptones. Peptones are never present in the urine in more than small quantities, and their detection is of no practical utility.

HEMI-ALBUMOSE IN THE URINE.—This body has been found in the urine in osteo-malacia, in glycosuria, and in phthisis. It gives a precipitate with nitric acid, which is dissolved in the acid on heating, giving a bright-yellow colour. The urine on being heated becomes cloudy, but clears on further heating, the precipitate re-appearing on cooling.

MUCIN IN THE URINE.—Mucin is very frequently present in the urine. It is precipitated by the addition of citric or acetic acid. The "mucin" ring obtained by the addition of nitric acid has been already described.

ROBERT MAGUIRE.

ALCOHOL (ethylic alcohol, $C_2H_5.OH$) has not been obtained in a perfectly pure state. "Absolute alcohol," the purest form obtainable, contains from 1 to 2 per cent., and "rectified spirit" 16 per cent., of water; "proof spirit" contains 53 per cent. of alcohol by volume. The strength of the various alcoholic beverages in general use will be found under ALCOHOLIC LIQUORS.

Alcohol evaporates readily, and, when applied to the skin, carries off heat rapidly, producing a sensation of cold and causing contraction of the blood-vessels. If evaporation be prevented, as by covering the surface with a layer of oiled silk, it penetrates the epidermis

and stimulates the cutis, producing hyperæmia and a feeling of warmth. In either case the cuticle is hardened.

Applied to a mucous membrane, it causes coagulation of the mucus lying on the surface, and astringes the membrane.

In the mouth alcohol stimulates the salivary secretion. In the stomach, in small amounts, it stimulates the vascular supply of the wall, producing an increase of secretion, a feeling of warmth and appetite, and an augmentation of peristaltic movement. In large amounts alcohol checks the action of the gastric ferment, and causes irritation of the gastric mucous membrane, with consequent diminution or perversion of its secretions.

Probably from the mouth it exerts a reflex stimulus on the cranial circulation, and from the stomach a similar influence on the heart. These reflexes are with difficulty separated from the direct action of alcohol.

Alcohol is absorbed unchanged from the stomach and carried into the circulation, where it is in part destroyed, and in part excreted by the lungs. A small amount passes out in the urine. Alcohol is absorbed also from the lower bowel, and may be administered in the way of an enema.

In the blood it diminishes the oxidizing power of the hæmoglobin, and thereby lessens tissue change and waste. Alcohol acts also as a food, like sugar and other carbo-hydrates.

It causes dilatation of the vessels of the surface of the body, producing a feeling of warmth and a general flush, especially observable in the parts which are usually exposed to the air, and whose vaso-motor mechanism is therefore the most active. The pulse is quickened, and the whole circulation becomes accelerated.

Owing to the increased activity of the circulation, the cerebral functions are stimulated, producing, for a time, liveliness, alertness, mirth, and good-fellowship, with increased hardihood and power of muscular exertion. These effects are, however, but of short duration.

The action of alcohol on the circulation, causing an increased surface elimination of heat, unites with its action on the blood—whereby heat production is diminished—to lower the bodily temperature.

After a time, supposing a considerable dose to have been taken, the direct effects of alcohol on the nervous system become manifest.

The intellectual faculties are first attacked, the judgment being early im-

paired; the power of articulation is soon affected, and speech becomes "thick"; paralysis of the cerebellum produces double vision, vertigo, and staggering. Drowsiness and loss of power in the limbs follow; and if a very large dose have been taken, the respiratory centre is paralysed, sleep passes into coma, and death occurs from asphyxia. If, in animals, artificial respiration be maintained, a large dose of alcohol is found to produce death by gradual paralysis of the heart.

Very large amounts of strong alcoholic liquor rapidly ingested have been found to produce death by shock—that is to say, by a sudden reflex inhibitory action from the stomach to the heart. Persons intoxicated by alcohol are, on the other hand, remarkably exempt from the shock of severe injuries, probably owing to the paralysed condition of the reflex vaso-motor apparatus.

Alcohol appears to exercise an inhibitory action on the bowels, and a dose of strong alcoholic liquor will frequently check diarrhœa; but the nature of the action is obscure.

Large amounts of alcohol produce irritation of the stomach, causing vomiting, loss of appetite, dryness of the tongue, a feeling of intense depression, and severe general headache. The more concentrated the alcohol the greater is the irritation of the stomach. Alcoholic liquors therefore irritate less when taken with food than when imbibed on an empty stomach. Strong alcoholic liquors derange the functions of the liver, but in what manner is not clear.

The physiological action of alcohol itself is somewhat difficult to separate in practice from that of the ethers with which it is found associated in most alcoholic liquors.

The continued ingestion of alcoholic liquors in considerable amounts is liable to produce fatty infiltration of the liver, omentum, heart, and subcutaneous tissue, shrinking of the brain from partial degeneration, and thickening of its membranes. In rarer cases a degeneration of peripheral nerve fibres is found, coupled with increase of the fibrous elements of the nerves involved (*vide* PERIPHERAL NEURITIS). The habitual use of the stronger forms of alcoholic liquor leads to serious disease of the liver, involving a thickening of its fibrous elements and atrophy of its parenchyma (*vide* CIRRHOSIS).

The excessive use of alcoholic liquors predisposes, at least in the elderly, to

the development of tubercle. There is some reason to believe that in the young it checks for a time this form of growth. The development of malignant disease, there is also reason to believe, is hindered by the free use of these liquors.

The use of certain kinds of alcoholic liquors markedly predisposes to gout, and through gout to granular disease of the kidneys, but alcohol appears to have no direct pathological action on the kidneys. Intemperance has a distinct effect in the production of mania, dementia, and certain other forms of insanity. It is doubtful whether it is to any great extent a cause of general paralysis.

The effects of continued alcoholic excess, as observed clinically, apart from the more definite lesions mentioned above, are described under CHRONIC ALCOHOLISM and DELIRIUM TREMENS.

The induction of pathological lesions is the more probable the more concentrated the state in which the alcohol is introduced into the circulation. Independently of this, special forms of alcoholic liquor have a particular tendency to the production of special lesions. Those in which much alcohol is combined with sugar or much free acid, for example, tend to induce gout. Whisky and gin particularly give rise to cirrhosis; brandy is especially prone to excite delirium tremens. Some special nervous maladies are attributed to particular kinds of wine in the neighbourhoods in which those wines are grown.

That the general health is deteriorated to a marked degree by the use of alcoholic liquors beyond very moderate amounts is certain. Dr. Parkes regarded the daily consumption of an ounce and a half of alcohol as the utmost amount compatible with the maintenance of full vigour in a strong man. This would be equivalent to a pint and a half of ordinary English beer, three parts of a bottle of sound French or German wine, or three ounces of Scotch or Irish whisky. Any increase of the alcoholic habit beyond some such grade as this is attended with a progressive decline in the average longevity of the subjects of the habit. The strictly temperate in the use of alcoholic liquors would appear, on the average, to enjoy at least ten years more of life than the habitually intemperate. The shortening of life, however, caused by the *extremes* of intemperance is probably much greater than ten years.

The shortening of life due to alcohol is only in part caused by the induction

of special "alcoholic" lesions of so well marked a type as cirrhosis, gout, and peripheral neuritis. The changes wrought by the drug in the body appear to be such as to induce an increased predisposition to the attacks of disease in general. Deaths from "old age," as it is termed, without obvious pathological lesion, are far more frequent among the temperate than the intemperate.

The prevalent belief that the liability of pneumonia to a fatal issue is increased by alcoholic habits is not borne out by the statistical evidence available; nor does it appear that the intemperate are especially liable to prostatic enlargements and the vesical disorders incident to advanced life, as has been asserted. The tendency to arterial degenerations seems to be augmented by alcoholic excess, and the intemperate are more liable than the temperate to death from cerebral hæmorrhage, but not to such a degree as to justify us in considering this a specially "alcoholic" form of disease. The same may be said of degenerative diseases of the heart-wall. It is doubtful whether bronchitis is materially induced by alcoholic liquors, though the predisposition to catarrh of the upper part of the air passages is undoubtedly increased by the use of the stronger forms.

Whether the use of alcohol in the amounts specified by Dr. Parkes is really harmless, hurtful, or actually beneficial to the generality of mankind is a point which cannot at present be pronounced upon with any certainty. Statistical evidence has been adduced in abundance, from the experience of assurance and friendly societies, to establish the superior healthfulness of total abstainers as compared with the average of assured persons; but no direct comparison has yet been afforded between the general longevity of those who use alcoholic liquors in conformity with Dr. Parkes' rule and those who do without them altogether. It is clear, however, from a comparison of statistics, that any general detriment to health that may be thought to arise from total abstinence from alcohol is small in comparison with that caused by even moderate excess in its use. For the ordinary run of mankind living under fairly healthy conditions, alcoholic liquors must be regarded as luxuries, practically harmless if indulgence in them be restrained within strict bounds, but distinctly hurtful if those bounds be exceeded, and containing in themselves, for a large part of the population, a very serious temptation to excess. In condi-

tions of malnutrition, during convalescence, and in cases of scrofula and phthisis, wines and sound beers are often found to have a distinct tonic and restorative effect, but, a certain proportion of such cases and some conditions of severe illness apart, it is only exceptionally that the practical physician need insist on the use of alcoholic liquors, or hesitate to sanction their disuse if on other grounds it may seem desirable to do without them.

Medicinal Uses.—The rapid evaporation of alcohol, and its consequent power of reducing the temperature and, when applied locally, of contracting the blood-vessels of the surface of the body, is taken advantage of to relieve "nervous" headaches and to check inflammation in sprains and recent injuries. In the former case brandy, whisky, or eau-de-Cologne is either rubbed on the forehead and temples or sprayed upon them, or applied upon a piece of lint or linen, and allowed to evaporate. In the latter case a piece of lint soaked in some form of spirit is placed upon the injured part, kept constantly moist, and exposed to the air. Evaporation may be promoted by fanning.

Its power of hardening the epidermis is utilized to prevent threatened bedsores and cracks in the nipples. The part affected is simply bathed in spirit two or three times a day.

Diluted spirit is used also as an astringent wash or gargle to the mouth or throat in cases of relaxation, ulceration, and salivation, and as an application to the eyes in slight conjunctivitis.

Friction with spirit is employed as a stimulating application to the surface in cases of sluggish circulation, local chill from exposure to cold, passive œdema, chilblain, muscular pains, sprains, and chronic affections of the joints. It is similarly applied to the præcordia with the view of reflexly stimulating the heart in syncope or shock, and indeed to any part for which a mild local stimulant or counter-irritant is indicated.

A teaspoonful of strong brandy, whisky, or liqueur held in the mouth is sometimes found to relieve toothache.

Internally administered, its power of exciting the gastric functions may be utilized. In cases where, without obvious reason, the appetite fails at meal-times, a glass of light wine taken about a quarter of an hour before sitting down to table is sometimes found to arouse a desire for food. In many people a little wine taken with a meal promotes the operation of digestion, and in some weakly and aged

persons a small glass of liqueur or strong spirits taken after the meal is a needed stimulant to gastric activity. The need for alcohol as an aid to digestion is most often found in convalescents and in persons exposed to overwork and worry, especially in those engaged in a close and unhealthy atmosphere. In such cases it is difficult to separate the direct effects of the drug on the stomach from the indirect effects brought about by the promotion of cheerfulness and the relief of mental depression. The action of the alcoholic stimulant is probably complex. The physician should be careful in such cases to avoid recommending it until he has made every effort to ascertain and remove the cause of the symptoms, as few uses of alcoholic liquors have a greater tendency to lead to excess than this. In many instances a small cup of beef-tea taken shortly before a meal, or one of strong coffee, or even of hot water alone, immediately after, will succeed as well as the alcoholic stimulant, and is without its disadvantages. Ten grains of bicarbonate of sodium taken in half a wineglassful of water may replace the beef-tea, and the judicious use of pepsin or of bitter tonics may obviate the need of a stimulant altogether. It is hardly necessary to add that in a large number of such cases over-feeding is the sole cause of the symptoms. In cases of irritation of the stomach alcoholic liquors should be wholly avoided.

Wine and beer, as above stated, may be of restorative and tonic value in cases of malnutrition, especially in scrofulous and phthisical states.

Alcohol, usually in the form of brandy or other spirit more or less diluted, is constantly used to stimulate the circulation and relieve embarrassment of the heart in cases of heart disease, functional or organic, bronchitis, emphysema, and other chest affections; and to restore the circulation in syncope, shock, or chill of the surface from exposure to cold.

In the last-named case it is not safe to employ alcohol unless the body can be at the same time placed in a warmer atmosphere. The power of alcohol to restore warmth to the surface results from its property of dilating the peripheral vessels. If the surface remains exposed to cold, the blood as a whole is liable to be cooled down to a dangerous degree.

A dose of alcohol is of service in fitting the body to undergo some unusual exertion, or to withstand the shock of unusual suffering, or to resist exposure to unhealthy effluvia or zymotic contagia;

but the effects in this regard are transitory, and it is best avoided, on account of the succeeding depression of the nerve-centres, when the exertion or exposure is likely to be prolonged.

Its continuous use, however, sometimes relieves the weariness, restlessness, pain, and mental depression of chronic illness.

Alcohol is a food, not, it is true, of much value in ordinary health, but, as it requires no digestion, of great utility in some cases of severe illness or extreme senility, when the digestive functions are in abeyance, and other kinds of food are either not tolerated or not properly assimilated.

The stronger kinds of alcoholic liquors, especially brandy, are often employed with success in relieving colic and diarrhœa. The relaxation of the vessels which alcohol causes renders it of service in inducing the menstrual flow in cases of dysmenorrhœa without organic cause. In such cases it needs to be given with great caution, as the risk of temptation to excess is great. It should be prescribed in a pharmaceutical form, and not in the shape of wine or spirits.

Alcohol is employed in the treatment of fevers and febrile diseases with five objects—first, to aid the stomach in digesting food; secondly, to provide an easily assimilable form of food; thirdly, to check the excessive tissue waste of the pyrexial state and to aid in lowering temperature; fourthly, to maintain the circulation against the depressing effects of the disease; and, fifthly, to relieve weariness, restlessness, and pain.

The disadvantages of its use in these conditions are its tendency to irritate the stomach and hinder the assimilation of food, and its paralyzing effect, if large amounts are absorbed, on the respiratory centre. Irritation of the stomach will be evidenced by dryness of the tongue and decreased inclination for food; respiratory paralysis, by enfeebled action of the respiratory muscles. The use of alcohol in any given case must be governed by the balance of advantages and disadvantages.

It is certainly not required in all cases of severe fever or inflammation, and should never be prescribed as a matter of routine or without some definite object in view. If prescribed, its administration should be as carefully regulated with reference to time and quantity as that of any other drug, and its effects on the pulse, respiration, complexion, tongue, and general condition closely watched. If the pulse, respiration, and

general state improve, while the tongue remains moist and the capacity for taking food is unimpaired, the drug may be continued. If, on the other hand, the tongue becomes dry and brown and tolerance of food decreases, without any counterbalancing improvement in other respects, the alcohol is probably doing harm, and the dose should be lessened or its use abandoned. Diluted brandy or whisky are the forms of alcohol usually tolerated best in cases of fever; but some form of wine, still or sparkling, is in many cases found to agree better. As regards the amount it is impossible to lay down any rule. Much depends on the patient's previous habits, and in every case the dose must be a matter of experiment.

In prolonged convalescence alcoholic liquors may be useful in relieving the sense of tedium and weariness incidental to the condition and in stimulating the enfeebled digestive powers. In recovery from enteric fever they sometimes aid the patient in supporting the necessary abstinence from solid food.

An irritable condition of the stomach, the larynx or pharynx, or of the urinary organs is generally speaking a contra-indication to the use of alcohol. It should be avoided, for reasons given above, by persons liable to prolonged exposure to cold. In ordinary health alcoholic liquors should be taken only at meal-times, and especially avoided when the stomach is empty.

All experience goes to recommend abstinence from alcohol, as far as possible, to Europeans living in a tropical climate.

To conclude: In advising the use of alcoholic liquors the physician must constantly bear in mind the risk of exciting a taste for them which may lead to the development of the craving for drink to which probably one-third of the population of the United Kingdom are more or less liable. In doubtful cases the needed amount of alcohol may be more safely prescribed as a pharmaceutical draught than given in the form of wine or spirits.

ISAMBARD OWEN.

ALCOHOLIC LIQUORS. — The forms of alcoholic liquor in use in this country comprise wines, beers, and spirits, besides cider, perry, and liqueurs. Natural wines are the product of the fermentation of grape-juice. If the fermentation be complete and all the glucose converted, a "dry" wine results; if it be checked at a certain

point so as to leave some glucose unchanged, a "sweet" wine is obtained. "Liqueur wines" consist of grape-juice only slightly fermented and preserved from further change by added spirit. "White" wines are the product of white grapes, or of red grapes the skins of which have been excluded from the fermenting juice, or "must." If the skins of purple grapes are left in the must as it ferments, a "red" wine results. In "sparkling" wines a part of the carbonic anhydride generated in fermentation is retained in the liquid, and not allowed to escape until it is drunk. "Muscat" wines are made from grapes partially dried in the sun.

Natural wines contain, besides alcohol and water, acid tartrate of potassium, tartrates of sodium and calcium and other salts, free tartaric acid, malic and other vegetable acids in small amounts, extractive matters, a little free carbonic acid, and a number of delicate ethers formed by the action of the acids on alcohol, of which ceananthic ether is the most constant.

Sweet wines contain also a variable amount of glucose; red wines hold in solution some tannic acid and a colouring matter from the skins. Even white wines contain a trace of tannic acid.

The "strength" of wines is the proportion of alcohol they contain; the "body" depends on the amount and proper blending of the solid ingredients; the "bouquet" or perfume perceived by the nose, and the "aroma" or effect on the back of the nostrils when the wine is on the palate, are due to the ethers, and in some red wines to a volatile oil from the skins; the "savour" or taste is produced by the ethers, the acids, and the acid salts. "Roughness," or astringency, is the result of the tannic acid.

The stronger red wines, on keeping, deposit a "crust" of acid tartrate of potassium with tannic acid, colouring and extractive matter. A further development of flavouring ethers takes place when wine is kept. This is known as "maturing."

Natural wine may contain from 5 to 20 per cent. of alcohol. Practically, no wine of less alcoholic strength than 10 per cent. comes to this country. The weaker wines require the addition of so much spirit to enable them to travel by sea, and more or less spirit is added to all before the voyage. An amount of alcohol over 14 per cent. is most probably artificial.

The medicinal and pathological effects of wines depend on the alcohol, the ethers, the free acids, the tannin, the sugar, and the salts they contain.

The effects of alcohol have already been discussed. The presence of the ethers enhances its stimulant action, especially on the stomach and the brain. Hilarity is the characteristic cerebral note of intoxication by natural wine. The disengagement of gas from sparkling wine reinforces and accelerates the reflex stimulation which alcohol exerts on the brain and the circulation. The ethers have probably a pathological influence of their own on nerve structures; special nervous symptoms are locally attributed to certain wines rich in them. The acids and acid salts promote appetite, but if in excess may derange digestion. The tannin acts as a bitter tonic. The more astringent wines are apt to constipate. The salts as a whole supply some important elements of nutrition, and aid in the restorative effects of wine. An excess of tartar is apt to disorder the bowels. Wines containing a high proportion of alcohol in combination with sugar, as port, sherry, and Sauterne, or with much free acid, as Burgundy and Rhine wine, are prone to induce gout and lithiasis, and to cause digestive disturbances. Sweet wines are, of course, inadmissible in diabetes.

Most of the wine drunk in this country is supplied, or purports to be supplied, by France, Germany, Spain, and Portugal. Madeira is being re-introduced, and a few varieties of Italian and Hungarian wine have become commonly known.

Good red Bordeaux, or "claret," wines, from the district of the Gironde, are hygienically the ideal wines of the world. Moderately alcoholic (from 8 to 13 per cent. of alcohol) and completely fermented, they are of good body and well supplied with ethers, but, when properly matured, contain no excess of tartar or of tannin, and only so much free acid as is necessary to keep them from tasting "flat." They can therefore be borne by even the most delicate stomachs, and, while tonic and restorative, have little or no tendency to excite gout or lithiasis. Unfortunately, genuine claret is difficult to obtain even in Bordeaux itself, large quantities of inferior red French, Spanish, Portuguese, and Italian wine being fortified and flavoured, and sold as the produce of the Gironde. The white Bordeaux are slightly more alcoholic than the red. They are less sophisticated and less imitated. They are only slightly acid, and are well borne by the stomach. Sauterne

is made in dry and sweet varieties; Graves and Barsac are usually somewhat sweet. The sweet varieties should be avoided by the gouty.

The red Burgundy wines are more alcoholic and of greater body than the Bordeaux. They possess marked stimulant, tonic, and restorative properties, but, though fully fermented, are less suited to delicate digestions, and are prone to excite gout by reason of the amount of free acid they contain. Chablis, the best-known white Burgundy, is a perfectly "dry" wine, and not over-acid. It is less "gouty" in tendency than the red kinds.

The sparkling white wines of Champagne contain from 6 to 13 per cent. of alcohol, and more or less sugar. A part of the alcohol, and in most cases all the sugar, are artificial additions; the latter is inserted in the form of cane-sugar, but becomes altered in the direction of glucose by keeping. The acid in most champagnes is moderate in amount, but the sugar renders them unsuitable to the gouty, and apt to disagree with the stomach. The "drier" kinds are, of course, less hurtful in these respects than the sweeter. They are exhilarating wines, speedy in their action on the brain and circulation, calculated to promote temporary cheerfulness, or to supply a rapid stimulus in conditions of syncope and exhaustion, but of little restorative value.

Deleterious imitations, fabricated from inferior white wine or rhubarb-juice, abound. Similar wines, but of inferior character and much lower price, are made on the Loire, and imported under the names of "Vouvray" and "Saumur."

"Roussillon" is a sweet red wine, used as a substitute for port. Its alcohol, as it issues for sale, ranges from 11 to 16 per cent.

The white wines of the Rhine, between Mayence and Coblenz, generically known in this country as "hock," are fully fermented and rather highly alcoholic, ranging from 7 to 14 per cent., or even higher in the best class of wine. They are of good body, and possess restorative properties, but contain an excess of free acid, which renders them unsuited to the gouty or lithatic. They are extensively imitated by fermenting glucose on the lees of the real wine, and care is needed to procure them genuine.

Moselle wines are for the most part of low alcoholic percentage, and require the addition of spirit to enable them to travel

to England. Like the Rhine wines, they contain much free acid.

The sparkling "hocks" and Moselle wines resemble champagne in character, but are usually very sweet. Sparkling Moselle is flavoured with tincture of elderflower.

Port, from the upper valley of the Douro, as made for the English market, is a partially fermented wine brought up to a high alcoholic percentage (15 to 23) by the addition of brandy, and further flavoured and coloured with slightly fermented grape-juice. It is a full-bodied wine, and contains a large amount of tannin, but has little free acid, and, when new, is deficient in ethers. It is a powerful stimulant on account of the large proportion of alcohol, but its effects are not of an exhilarating character. It possesses marked tonic and nutritive properties, and the combination of alcohol and tannin renders it of service as an astringent gargle in relaxed conditions of the throat. It is a form of alcohol well suited for administration in fevers. Its "gouty" tendencies are decided, but diminish by keeping. Imitations are extensively made from red Spanish wines at Tarragona, from Roussillon and other southern French wines at Certe, and from unknown materials at Hamburg and in London.

Sherry, as made for English use in the district of Jerez de la Frontera, is an incompletely fermented white wine heavily fortified with brandy. The tartar and free acids are extracted by sulphate and carbonate of calcium (a process termed "plastering"), a large amount of sulphate of potassium, a little sulphate of calcium, and a trace of sulphuric acid being left in the wine. Further sweetening, flavouring, and colouring are effected by means of concentrated must, concentrated wine, cane-sugar, or caramel. Some of the "pale" sherries are artificially bleached by charcoal. The completed "sherry" contains from 15 to 25 per cent. of alcohol, more or less sugar or unconverted glucose, sulphates as aforesaid, no tartar, and hardly any free acid. Except in the drier varieties, the ethers are deficient. The drier varieties of sherry are more natural wines than the sweet. "Manzanillas," which possess a flavour of chamomile, are fully fermented wines, and contain little or no adventitious spirit. The "Amontillado" flavour is a special ethereal product developed by some specimens of fully fermented Jerez wines. The exhilarant power possessed by the finer dry varieties

is wanting in ordinary sherry, which, though highly stimulating in virtue of its alcohol, possesses no tonic or restorative properties. Even the dry sherries are too alcoholic to be drunk undiluted by the gouty with impunity; the sweeter kinds are as "gouty" as port, and their tendency to cause digestive disturbances, partly due to the sulphate of potassium, is strongly marked. Like port, sherry is the subject of extensive imitation. Greek wines are manufactured into sherry at Hamburg, and much Marsala is sold under the name.

The remaining wines commonly drunk in this country are the Hungarian Carlowitz, a fully fermented red wine of full body and high alcoholic strength, containing an excess of tannin and possessing marked tonic properties; the Tuscan wines sold under the name of "Chianti," which at their best closely resemble Bordeaux, though stronger and richer in tannin; Marsala, a highly alcoholic sweet white wine made in Sicily, resembling sherry in flavour; and Madeira, of which we have sweet and dry varieties. Madeira contains from 17 to 22 per cent. of alcohol, some of which, as is also the case with Marsala, is probably adventitious. It has, when new, an excess of tartar, which is deposited on keeping. The maturation of Madeira is aided by a hot climate.

Beers are fermented infusions of malted barley, rice, maize, or other grain, flavoured with hop. The "body" of beer consists of dextrin, malt-sugar, and extractives, and constitutes about 5 per cent. of its weight. English beers contain about 5 per cent. of alcohol (the stronger kinds go as high as 10 per cent.) and a little aldehyde. The continental beers brewed on the "Bavarian" system have no aldehyde and only about half the alcohol of the English. Beers contain also a little free acid, lactic, malic, gallic, and acetic, some dissolved carbonic acid, which gives the "briskness," and a small amount of salts, with bitter hop-extract and a trace of volatile oil. Porter and stout are brewed from high-dried malt, and are blackened by products resembling caramel derived from the charring. "Bottled" beers are made on the same principle as "sparkling" wines. The dextrin, maltose, &c., contained in beers are utilizable as food, and tend to adiposity. The hop extract exercises tonic properties. The light continental beers have only slightly intoxicating qualities; the English beers exercise far more effect on the brain than the foreign,

in consequence of the aldehyde they contain. This also tends to render the intoxication of a stupefying character. Beers are apt to disagree with the stomach, and have a tendency to aggravate cough. The combination of sugar and alcohol in English beers makes them unsuitable for the gouty. New beers are liable to induce oxaluria.

Spirits are strong alcoholic liquors prepared by distillation. They usually contain 45 to 60 per cent. of alcohol, but they range much higher.

Whisky is distilled from a fermented mash of malt, or malt and grain mixed. Besides alcohol and water, it contains, when new, fusel oil (chiefly amyl alcohol, with some propyl, butyl, and other alcohols), a trace of ethers, of volatile oil, of acid, and of a flavouring matter derived from the malt. On keeping, the fusel oil disappears, and a further development of ethers takes place. Whisky should be kept at least two years before being drunk. When well kept, it is the purest form of alcohol commonly in use. In good distilleries its strength is uniformly about 50 per cent. Properly diluted, it has little tendency to derange the stomach or to induce gout or lithiasis. New whisky speedily produces cerebral intoxication, tending to a furious character, and the habitual use of it is liable to lead to serious nervous disorders.

Brandy is, properly speaking, distilled from wine. It contains the vinous ethers as well as the alcohol. Its colour is due to the oak casks in which it is kept, from which it derives also a trace of tannin. The darker kinds are coloured with caramel. Inferior kinds of brandy are distilled from the lees of wine. Brandy contains no fusel oil. The presence of the ethers renders brandy a ready stimulant to the stomach, circulation, and brain, and therefore especially useful in cases of syncope, spasm, shock, arrested digestion, or diarrhoea. It is the form of alcoholic liquor commonly preferred in the treatment of fever. The cerebral intoxication it produces tends to the furious type, and its habitual excessive use is especially liable to induce delirium tremens. Brandy drinkers are also subject to relaxation of the throat and larynx, due probably to the ethers eliminated in the breath. Imitations of brandy are obtained by the fermentation of potato starch and subsequent distillation. They contain, unless very carefully prepared, a large amount of fusel oil, and are exceedingly deleterious.

Gin is distilled from fermented grain

and flavoured with oil of juniper and other aromatic substances. It is sold sweetened or unsweetened. The oil of juniper has a diuretic action. The alcoholic strength of gin is usually below 50 per cent.

Rum is distilled from molasses. It is a very strong spirit, ranging to 75 per cent. of alcohol or higher. It contains a large quantity of butyric ether, to which its peculiar flavour is due.

Cirrhosis and neuritis are more frequent among spirit drinkers than among users of wines or beers, this being due to the degree of concentration in which the former are prone to take the alcohol. Spirits have no tonic or nutritive effects beyond those of alcohol.

Liqueurs are strong spirits, sweetened with sugar and flavoured with various aromatic substances. Ethers are developed in some kinds by keeping. They can hardly be considered medicinal agents, and their pathological effects are mainly those of strong alcohol. The "absinthe" so extensively consumed in France, which is highly flavoured with oils of wormwood and anise, produces a stupefying species of intoxication and, when habitually used, giddiness, tinnitus, illusions of sight and hearing, numbness, paresis, epileptic fits, and dementia, besides the symptoms due to the alcohol.

Ciders are made by fermenting the juice of apples. In the natural state they contain less than 5 per cent. of alcohol, some sugar, and a large amount of free acid, chiefly malic. Notwithstanding the acid and sugar, their low alcoholicity renders them permissible drinks for the gouty, but they are apt to produce derangements of the stomach and bowels. They are sometimes found to be contaminated with lead from the presses employed, and to give rise to all the symptoms and lesions of saturnism.

Perry is a similar drink, of very low alcoholicity, obtained from pears. It contains much less free acid but more tannin than cider, is rather sweet, and is a harmless beverage.

Bottled cider and perry are usually more or less fortified with spirit.

ISAMBAUD OWEN.

ALCOHOLISM.—The immoderate use of alcoholic liquors, especially of the stronger kinds, is liable to produce, probably in about one person in every three of the population of the British Isles, and especially in the children of the intemperate, a craving for alcohol which partakes of the nature of an insane impulse,

and which, in its severer forms, neither reason, nor will, nor fear, nor anything short of physical restraint can control. The craving is partly gastric, partly mental, and treatment must be directed to both sources. The condition of the stomach and bowels must be carefully looked to, and the power of will assisted by maintaining the general vigour and sense of *bien-être* as much as possible. Nourishment must be given in abundance if the stomach is capable of dealing with it, and, to supply as far as may be the place of the accustomed stimulus, it should consist largely of meat and soup: beef-tea or diluted fluid extracts of meat being used as drinks. The local stimulant to the stomach may be replaced to some extent by the use of condiments, or the administration of tincture of capsicum in 10 to 20 minim doses. Ammonia will supply both a local and a general stimulant action. Alcoholic liquors should as a rule be discontinued entirely from the outset of the treatment, but at times the substitution of some light liquor, especially German beer, which is brisk and stimulating to the palate without containing much alcohol, will answer better. Perchloride of iron (20 to 25 minims of the tincture three times a day), arsenic (3 to 5 minims of liquor arsenicalis), and liq. strychninæ (5 to 10 minims), have also been found of service. In men, especially in such as are engaged in active employments, treatment is often efficacious; in women it is doubtful whether the drink craving is ever completely overcome.

Chronic Alcoholism.—Besides the craving, a train of symptoms assignable jointly to the nervous and digestive systems results from habitual intemperance. This includes sluggishness of intellect, loss of alertness, irritability, depression of spirits, perversion of the moral tone (particularly as regards truthfulness and honour), enfeeblement of will, "nervousness," a liability to be startled, and a slight muscular tremor observable in the hands, tongue, and lips, coupled with loss of appetite, nausea, vomiting of clear fluid on rising in the morning, and looseness of the bowels, four or five semi-fluid motions being passed daily without pain. The tongue becomes thickly coated and the breath offensive. The eyes are dull, bloodshot, and watery, and the face, especially the nose, is usually congested, the alcoholic dilatation of the vessels having become permanent. Spots of a sluggish acne, vulgarly called "grog-blossoms," are often present. If

the indulgence have been chiefly in spirits, the voice is frequently hoarse from irritation of the larynx by the alcohol and accompanying ethers excreted in the breath, and an irritable cough may be present from a similar affection of the pharynx and soft palate, which will be seen to be red and "velvety." More definite forms of cerebral or nerve disturbance are occasionally added—subjective sensations in the trunk or limbs, illusions of the senses, definite delusions, or transitory maniacal attacks. The symptoms may be complicated with those of the more serious alcoholic affections, commencing mania, dementia, peripheral neuritis, cirrhosis, or gout.

The first object in the *treatment* of such a case is to obtain the assimilation of food. The stomach should at the outset be cleared from adherent mucus by a brisk emetic, a table-spoonful of mustard stirred up in a pint of lukewarm water, or a scruple of ipecacuanha in powder. Five grains of blue-pill, followed by a black draught, may be given as soon as the patient recovers from the effects of the emetic, unless there be much diarrhoea. Then, without waiting further, a diet chiefly of meat, fish, eggs, and strong soups should be commenced and pushed to the limit of the gastric powers, tolerance being obtained, if necessary, by the use of bismuth and hydrocyanic acid. *Liquor strychninae*, in doses of 3 to 5 minims, or quinine in 2-grain doses, or salicin in 10-grain doses, should be commenced as soon as the stomach will bear it. An equivalent dose of tincture of *nux vomica* or of liquid extract of cinchona may be substituted if borne better, and infusion of gentian, calumba, or cascarrilla used as the vehicle. If the stomach remains irritable, a powder of the carbonates of bismuth and magnesium, 10 grains of each, should be given after each meal; or, if vomiting be present, they may be made into a mixture with a little mucilage, and 3 or 4 minims of dilute hydrocyanic acid added. Should looseness of the bowels persist, astringents will be found of less service than arsenic, which may be given in the form of liq. arsenicalis, 3 to 4 minims, three times a day, just after meals. Sleeplessness, if present, must be combated with a dose or two of chloral hydrate, or a full dose of bromide of potassium, at bedtime, or with sulphonal in doses of 15 to 30 grains. Morphine is best avoided.

The supervention of **Delirium Tremens** is the most prominent danger in a case of chronic alcoholism. In such a

case, the shock of an injury or operation, or an unusual demand on the system from overwork, sleeplessness, acute illness, or inability to take food, may induce an attack of delirium tremens.

The tremor and gastric symptoms increase, a sense of depression and dread becomes paramount, the patient grows restless, excited, and extremely irritable, and ultimately mental disturbance, varying from slight delusions to wild delirium, sets in. The delusions are in accord with the state of restlessness and apprehension from which they start. The patient is anxious to get away from wherever he may happen to be, to go and do something somewhere else, or to escape from something or somebody. He is suspicious of those around him, fancying they want to do him some injury. If in bed, he perpetually tries to get at his clothes, to be up and off. He talks incessantly and incoherently, his delusions being seldom fixed. Objects of horror and loathing appear about him, from which he tries to flee. In less materialistic days they often assumed the forms of demons, now they are more commonly rats, snakes, spiders, and monkeys. Objective sensations are sometimes present. If the delirium increase, whole scenes of restless activity may be enacted in the patient's mind and made known to his attendants by his perpetual flood of rambling talk. Usually they are dominated by the master-sense of dread, and interrupted by wild fits of terror and fury, in which, if not restrained, he will attack his attendants and try to escape at all hazards, jumping, it may be, out of a window or over the balusters. Occasionally, however, the visions partake of a cheerful and even humorous character.

The tremor is constant; the surface is pale and usually moist and clammy, the pulse large and soft or small and weak. The patient sleeps little or not at all, the tongue is coated thickly, the breath foul, and appetite is absent. The temperature is usually only slightly raised; but pyrexia, and even hyperpyrexia, may set in. The pupils are generally dilated.

If the disease be not checked, death usually takes place from exhaustion, the patient sinking into the "typhoid" state. Occasionally fatal syncope ensues.

No special post-mortem appearances, beyond those proper to alcoholism generally, are found.

Delirium tremens has been known to develop suddenly in persons previously temperate, as the consequence of a single debauch.

The *prognosis* is usually favourable, especially in first attacks; but the affection is liable to recur on comparatively slight provocation.

The indications for *treatment* are three: to restrain the patient from injuring himself or others, to procure sleep, and to support strength by the administration of food.

The patient must be put to bed and constantly watched, his efforts to get up being restrained by the commands, and, if necessary, by the hands, of his attendant. In severe cases the mechanical restraint of bandages or shackles may cause less exhaustion than the attendant's efforts, or a padded room may be made use of during the most violent stage. The medicinal treatment should be commenced, as in the case of "chronic alcoholism," by an emetic and a mercurial purge, unless there be much diarrhoea or the patient greatly exhausted. In any case solid food must be pressed upon the patient as far as the stomach will bear it, tolerance being procured, if necessary, by hydrocyanic acid, of which 4 minims may be given with a scruple of sodium bicarbonate three or four times a day, about half an hour before food is offered. If solid food cannot be borne, strong soups and eggs beaten up in milk, should be substituted, and, if vomiting persists, rectal alimentation must be resorted to.

A draught containing 15 grains of chloral hydrate and a scruple of potassium bromide should be given every four hours, or even oftener, till sleep is procured. A drachm of tincture of hyoscyamus is sometimes added with advantage, and cannabis indica, to the extent of a grain of the extract or 20 minims of the tincture, if the chloral and bromide fail by themselves. Sulphonal in doses of 15 to 30 grains has lately proved of service. Should no improvement ensue and sleep be still absent, an injection of $\frac{1}{2}$ to $\frac{1}{4}$ grain of morphia should be substituted for the bromide and chloral treatment, and repeated as required. But the use of morphia in such cases is not without risk, especially if chronic Bright's disease be present. In case of great weakness, ammonia, brandy, and ether must be given freely. The cautious inhalation of chloroform may be of service if the delirium be violent.

Except in the event of extreme weakness alcohol is better avoided altogether in the treatment of most cases of delirium tremens. In some instances, how-

ever, a moderate amount of malt liquor—*e.g.*, a pint of porter daily—seems to be beneficial.

ISAMBARD OWEN.

ALOPECIA (*Calvities*) signifies baldness, whether congenital or acquired, local or general, partial or complete. There are various clinical types of the disease, but they are not separated from one another by hard-and-fast lines. The following are those most generally recognised:—

Alopecia universalis congenita, a very rare condition, in which there is absence or arrested development of the hair follicles; the teeth, nails and, more rarely, the nipples, are badly developed. After some months or years a small quantity of hair usually appears. Congenital bald spots on persons otherwise healthy persist as such throughout life.

Alopecia universalis acquisita affects young adults of either sex after nervous shock or without ascertainable cause. The hair of the scalp, eyebrows, beard and other hairy regions falls simultaneously. Recovery, or even improvement, is quite exceptional. For treatment, *see* ALOPECIA AREATA.

Alopecia senilis is a frequent but not necessary concomitant of old age, when the skin becomes generally atrophied and the arterioles sclerosed. The hairs usually turn grey, become dry and shrivelled, and their bulbs atrophy and fall out. Baldness, as a rule, extends from the forehead backwards, or may begin at the vertex. The beard is not generally affected to the same extent as the scalp. The condition is comparatively uncommon in women, and is frequently hereditary. Treatment is unavailing.

Alopecia prematura idiopathica has clinical characters similar to alopecia senilis, but appears at an earlier period of life. The changes in the hair follicles appear to be secondary to a sclerotic process originating in the corium.

Alopecia prematura symptomatologica may be (1) the result of febrile affections, especially the exanthemata; (2) the result of disordered innervation—*e.g.*, after grief, shock, debauchery. In both forms the prognosis is hopeful; stimulating ointments or lotions materially assist constitutional treatment in hastening recovery; (3) secondary to other diseases of the scalp which impair the nutrition of the hair bulbs or destroy them by producing scars. Among the former may be cited, seborrhoea (alopecia furfuracea vel pityrodes), secondary syphilis, eczema,

psoriasis and tinea; baldness from such causes being partial and temporary. Among the latter, lupus erythematosus, kerion, favus, leprosy, and tertiary syphilis must be mentioned; baldness thus produced is complete and permanent, although generally patchy.

Alopecia areata, vel circumscripta, (Area Celsi), is pretty clearly demarcated from the previously described forms, although it has many points in common with *A. universalis acquisita*. It is characterized by the rapid formation of circumscribed, smooth, bald patches on the scalp or any other hairy part of the body, usually circular in shape and whitish in colour. The disease is very common in London, especially among anæmic, over-worked and under-fed children. Adults are also frequently affected, the eyebrows and beard being chiefly affected. The prognosis is then less favourable. The patches are commonly met with in the occipital region, behind the ears and over the parietal eminences; they often show a roughly symmetrical arrangement; their appearance is not generally preceded by any symptoms; in a considerable number of cases they are slightly pink at first, puffy and apparently infiltrated; they are usually sharply demarcated. The presence of stunted hairs at the edge, or of loose hairs outside the patch, should awaken suspicions of the case being one of tinea tonsurans, which may, under conditions of which we have no accurate knowledge, produce patches exactly like alopecia areata. Hence probably arise the differences of opinion with regard to the pathology of alopecia areata, many able observers maintaining that it is due to the presence of a vegetable parasite, of which very various forms are figured.

The following arguments may be advanced in favour of its origin as a tropho-neurosis, the result of disordered innervation:—It is sudden in its onset; it is not contagious; sensibility of the patches is sometimes markedly diminished; it may result from traumatism, or be associated with morphœa, neuralgia, megrim, or other distinctly neurotic disorders: similar patches have been known to follow the experimental division of nerves; the hair bulbs are wasted and the hairs slender at their points of exit from the follicles, not swollen and infiltrated as in parasitic diseases; anti-parasitic remedies are not more efficacious than other irritants.

In all doubtful cases the microscope must be used.

The great majority of cases, especially in young persons, recover after a variable time. Downy hairs first appear, but these frequently fall off several times before permanent recovery sets in, and the new hairs are often white; relapses are common after intervals of months, or even years.

The disease must be differentiated from tinea tonsurans, morphœa, and diseases which cause scarring of the scalp.

Treatment.—(1) *Constitutional*.—Freedom from worry or anxiety, fresh air and exercise, with nourishing food, are to be recommended. Cod-liver oil, arsenic, iron, quinine, phosphorus, and strychnine are all of value.

(2) *Local*.—Cantharides is probably the most efficacious local remedy for stimulating the growth of hair and expediting its pigmentation. The tincture may be painted over the patches night and morning, or the following lotion applied: *R* Aceti cantharidis ℥ss, glycerini ℥ij, spiritum rosmarini ad ℥viij. Corrosive sublimate in alcoholic solution, sufficiently strong to produce a rube-facient effect, may be dabbed on twice daily; *e.g.*, *R* Hydrargyri perchloridi grs. iv–viij, eau de Cologne et aquæ destillatæ aa ℥ss. Ammonia is also useful, the liquor ammonii fortioris being sometimes employed, but the following formula, which we owe to Erasmus Wilson, will be found more convenient: *R* Liquoris ammonii fortioris ℥j–℥ij, tincturæ cantharidis et tincturæ rosmarini aa ℥ij, spiritus vini rectificati ℥iv, olei amygdalæ et olei olivæ aa ℥j.

The official ointments of chrysarobin, sulphur and tar all have their partisans, especially as they meet both theories—parasitic and non-parasitic—of the causation of the disease.

Galvanism or the faradic brush is useful in some cases in which the neurotic origin is obvious, and where anæsthesia or other nerve disturbance is present. In any case it is as well to explain to the patient or his friends the tedious nature of the complaint, and the tendency to repeated relapses.

J. J. PRINGLE.

ALTERATIVES are substances which promote tissue change—*i.e.*, increase the metabolism of the tissues. They appear to make the tissues do more work, and that this may go on satisfactorily, a due supply of food and air

is necessary, a fact always to be borne in mind when prescribing this class of remedies. The most important of the alteratives are mercury, iodine, phosphorus, arsenic, and antimony. Certain vegetable alteratives—*e.g.*, sarsaparilla, sassafras, guaiacum, &c., are of exceedingly doubtful action.

AMENORRHOEA means absence of menstruation. It is physiological during pregnancy and lactation. At other times it may be the result of one of two conditions: either the menstrual bleeding does not take place—**suppression of menses**; or the blood does not escape externally—**retention of menses**.

Suppression of menses may be the result of—

(1) Constitutional disease. (a) Anæmia, and all conditions which cause anæmia, and (b) all wasting diseases, usually prevent the occurrence of the menstrual hæmorrhage. (c) Nervous conditions may suppress it, such as mental shock, anxiety, mental depression, melancholia. Probably, with these should be ranged change of residence. In all these conditions there is reason to think that suppression of menses is beneficial. The only *treatment* that should be employed is that required by the general condition causing the menstrual suppression. (d) Menstruation may also be suddenly arrested by exposure to wet or cold at the menstrual period, and the stoppage of the flow is often accompanied by pelvic pain. The *treatment* should be hot hip or foot baths, followed by rest in a warm bed; hot poultices may be applied to the hypogastrium, and, if the patient be full blooded, leeches to the groins or round the anus, or, in the case of a married woman, to the cervix uteri.

(2) The non-appearance of menstruation may be due to local conditions—*e.g.*, imperfect development of ovaries or uterus.

Imperfect development or absence of the ovaries is extremely rare, and its diagnosis so difficult as to be practically impossible. The uterus may be absent or imperfectly developed. Imperfect development of the uterus may be the result (a) of disease preventing the proper growth of the body, such as idiocy, cretinism, or wasting disease during adolescence. (b) But it may also be present in strong, well-grown women, who, in all other respects, enjoy perfect health. (c) After delivery, the involution of the uterus, which then takes place, may go on to atrophy. This is called superinvolution or puerperal atrophy of

uterus. Imperfect development or atrophy of the uterus is recognized by shortness or smallness of the body of the organ. By examining with one hand on the abdomen, and a finger of the other hand in the rectum, the uterus can be felt between the two hands. The cervix is usually normal as to size, or nearly so, while the body may be of the normal length, but not broader or thicker than the cervix, or the body may be so short that the length of the whole organ does not exceed two inches.

The *treatment* of these cases should be limited to remedying any disorder of the general health that may be present. It must be remembered that in some cases the menstrual function is established late, and that if the patient be seventeen, eighteen, nineteen, or even twenty, the uterus may yet develop. Even if it do not, the absence of menstruation is in no way detrimental to health, and the only way in which imperfect development of the uterus is injurious to the patient is in case of marriage, by the sterility which it entails. This applies also to puerperal atrophy of the uterus. The best advice that can be given the patient is to do without treatment, as by no possibility can it cause the uterus to develop. Galvanism, intra-uterine pessaries, and other irritants, have been employed for this purpose, and it is easy by such means to make the uterus bleed; but such bleeding is not menstruation, and it usually ceases with the irritation. It is true that there have been cases recorded in which treatment of this kind has been followed by the desired result; but they are so out-numbered by the failures, that it may be presumed they were cases in which the event would have been the same had no treatment been employed. Marriage is sometimes in such cases followed by the establishment of menstruation; but bearing in mind the lifelong unhappiness that may result from marrying in haste, marriage ought never to be recommended solely on account of its expected influence on health.

Retention of menses is the result of closure of some part of the genital passage below the body of the uterus. This may be due either to (1) congenital malformation or to (2) cicatrization.

(1) Congenital atresia most commonly affects the vagina, generally in its lower part, a transverse septum forming across the canal. This septum may be in the situation of the hymen, but is usually above it. There may be more than one

septum at different parts of the canal, or the vagina may be absent either entirely or through part of its extent. Congenital closure of the cervix uteri is exceedingly rare.

(2) Acquired atresia of the cervix most frequently occurs either from the use of caustics, or after amputation of the cervix. Atresia of the vagina may result from sloughing and ulceration occurring in the course of fevers, scarlatina, enteric fever, small-pox, measles, &c., or from sloughing after difficult labour, or from venereal ulceration. When, the passage being closed, menstruation has taken place, the menstrual blood accumulates behind the obstruction. During its retention changes occur in it which make it thicker and darker in colour. If the occlusion be low down in the vagina, this canal becomes distended and may form a tumour rising into the abdomen, and on the top of this tumour the uterus may be felt, the body of this organ not sharing in the dilatation. But if the atresia be situated higher up, the uterus and Fallopian tubes may become distended also. The distension of the parts usually produces pain, which occurs when fresh blood is added to that already retained—viz., at every menstrual epoch. Retention of menses is to be suspected when, together with amenorrhœa, we have a history of gradually increasing pain at the times when menstruation ought to have occurred. A history such as this should call for examination, first of the abdomen, in which, if the retention be of long standing, a tumour will be felt, then of the genital canal, to see if it be pervious. If there be a membranous vaginal septum, it will be felt as a bulging, elastic, convex swelling, which the retained blood behind it will probably make bluish in colour. If the vagina be wholly or partly absent, it will be felt to end in a cul-de-sac, and above it, by bimanual rectal examination, the tumour formed by the distended uterus will be perceived.

The *treatment* of this condition is to let out the retained blood. If the septum be membranous, this is best done by cutting through it with the Paquelin cautery-knife. If the vagina be wholly or partly absent, a new canal must be made. A sound must be passed into the urethra and a finger into the rectum. Then, with scissors or scalpel, the mucous membrane forming the bottom of the vaginal cul-de-sac must be cut through. When the cellular tissue beneath the mucous membrane has been reached, the dissection

must be carried on between the rectum and urethra with the handle of the scalpel, a spatula, or the finger-nail until the distended uterus has been reached. This must then be punctured and the fluid let out. Afterwards the opening must be prevented from closing, this is best done by a glass stem, and the new vagina must be kept patent by a vaginal rest or a glass drainage-tube. The opening by which the retained fluid is let out should always be a free one, but no pressure on the abdomen should be made to hasten the outflow. Strict antiseptic precautions should be taken. The cavity should not be washed out. The escaping fluid should be received by a large pad of dry absorbent wool applied to the vulva. This operation is not quite free from danger. The dangers are—(1) reflux of retained blood through a Fallopian tube into the abdominal cavity; (2) rupture of a Fallopian tube; (3) endometritis and the spread of inflammation along the Fallopian tube to the peritoneum; (4) decomposition of the retained fluid and septicæmia. These are best guarded against in the manner described, the important points being antiseptic care, a free opening, no pressure, no washing out. But should, subsequently, the discharge become foul, and symptoms of septic poisoning appear, the offensive discharge may then be washed away with advantage.

G. E. HERMAN.

ANÆMIA.—This term denotes the condition of a part or of the whole organism when the blood is either deficient in quantity or below the normal standard in quality—i.e., as regards its hæmoglobin. It is obvious, therefore, that the term is applicable to a great variety of conditions, according as the anæmia is local and limited, or general, affecting the whole body.

Local Anæmia—sometimes called “ischæmia”—can only be brought about in one way—viz., by mechanical interference with the blood-supply to the part. Whatever, then, causes an obstruction, transitory or permanent, to the arterial circulation in any region will produce anæmia of the district supplied by that artery. In many cases this is so transitory, owing to the free anastomotic circulation, as hardly to be worthy attention: but in other cases the lack of arterial blood is not so compensated, and the part suffers in nutrition and ultimately undergoes necrosis. Examples of transient local anæmia due to spasm of

vessels through vaso-motor stimulation are to be found in the first stage of inflammation, in the exposure of a part to cold, in the pallor of the surface induced by emotion or fright, or syncope, and notably in the condition known as Raynaud's disease. In inflammation this stage is rapidly succeeded by vascular dilatation (congestion); in exposure to cold—if long continued—by actual thrombosis; in emotional states, by the reaction due to the return to the normal. So, again, styptics, and such drugs as ergot, operate in the arrest of hæmorrhage by causing contraction of vessels and therefore of anæmia. As regards internal organs we have less certain knowledge concerning such transient anæmia; indeed, apart from the brain and spinal cord, no symptoms evince its presence, but in these organs certain transitory conditions of loss of function are attributable to anæmia. This is well seen in syncope. Anæmia may also be produced by compression of arteries or by blockage, as in thrombosis; but here, if the cause cannot be removed and there be no sufficient collateral circulation, the anæmic state passes into gangrene or necrosis (*vide* EMBOLISM: THROMBOSIS). Lastly, there may be a condition of anæmia of the surface with corresponding engorgement of internal vessels, as in the cold stage of ague, or in aortic disease, or, possibly, in Addison's disease, in the cold stage of cholera, &c.

General Anæmia is, however, the condition with which the name is most associated. It implies an alteration in the composition of the blood, due either to a diminution in its bulk or in its most important constituent—the colouring matter. The same condition—viz., a lowered proportion of hæmoglobin and therefore of the functional value of the blood as the great nutrient medium—results in either case, for in diminution of the quantity of blood (*e.g.*, from sudden and severe hæmorrhage) the actual amount of fluid is rapidly made up by absorption of water from the tissues (hydræmia), and the quality of the blood is thereby materially altered.

Forms of Anæmia may be (provisionally) dealt with under the heads of primary (essential or idiopathic) and secondary (or symptomatic). We say "provisionally" because it is hardly conceivable that the blood itself, which depends for its formation and standard composition upon the normal nutritional changes of the body, could be *primarily* diseased. At the same time it is con-

venient to retain the term "idiopathic" for those classes of disease in which there is reason to believe the fault lies with the organs concerned the most intimately with the processes of blood formation and blood destruction. Such idiopathic forms include chlorosis, pernicious anæmia, and the allied blood states of leukocythæmia and Hodgkin's disease (*q.v.*).

Causes of Anæmia.—Excluding the "idiopathic" class, we may consider the etiology of anæmia under the two heads of (1) deficient nutrient supply and (2) undue blood waste. Under the first head would be included any cause which interferes with a due supply of food material or of oxygen. The subject may be placed under circumstances of living or occupation which may deprive him of these necessities of life, and in consequence his blood composition will be lowered; or he may be the victim of derangements of the organs of digestion and assimilation, which lead to the same result. Anæmia, in its most extreme degree, is to be seen in cases of gastric cancer—a disease which may be quite latent, and in which no hæmorrhages may have occurred adequate to explain the anæmic state. Similarly, but less strikingly, it is shown in all cases of impaired digestion, functional or organic, and in diseases of the absorbent system. As regards oxygenation, there is ample evidence that exclusion from pure air (and light) is productive of a state of anæmia and debility. More obvious, and perhaps more frequent, are the causes which induce excessive loss of blood or of its essential components. Actual loss of blood from external or internal hæmorrhage is the most striking of such causes. Repeated small hæmorrhages have eventually the same effect as a single severe loss. Indeed, owing to the reparative powers, the latter may be quickly recovered from, whereas the former constitutes a more or less permanent drain and induces a chronic state of anæmia. Such latter instances are to be found in repeated attacks of intestinal hæmorrhage as from piles, or of uterine hæmorrhage, as in fibroid of the uterus, or in the repeated bleedings of the hæmophilic or scorbutic, or the insidious blood-loss due to the parasite—*anchyllostomum duodenale*. Again, long-continued suppuration and chronic albuminuria are fruitful causes of anæmia; chronic diarrhœa, continued fevers, malignant disease, tubercle, or blood poisons, as syphilis and malaria: or min-

eral poisons, as lead and mercury—all of which probably operate by destroying the corpuscular elements of the blood. Even excessive neuro-muscular activity will do the same; in fact, anything which makes a great demand on the vital powers, quickening metabolism without the compensating balance of increased nutrition. Lastly, the effects of natural evolution of the body, in its growth and decline, exhibit on each hand the operation of either insufficient supply of material to the needs of the growing organism, or a decadence and waste not made up for by the waning vital powers.

Effects of Anæmia.—When long continued, anæmia necessarily produces profound alteration in the organism, as evidenced by clinical and pathological signs. Many of these are referable to the cardiac debility induced by the effect on the heart-muscle of the impoverished blood. Experimentally, fatty degeneration of the heart has been brought about by repeated blood-lettings; and fatty degeneration—a retrograde metamorphosis of the protoplasmic elements—is a common consequence of anæmia, whether it may be brought about by defective metabolism due to the want of sufficient oxidation of tissue, or by incomplete conversion of albuminoid material. As indications of this cardiac weakness may be mentioned such symptoms as palpitation, tendency to syncope, and dyspnoea, together with the cardiac bruits and the evidence of enlargement of the left ventricle. The deficiency in hæmoglobin, and consequently lessened oxygen-holding power of the blood, accounts for the dyspnoea and probably for other symptoms also. The tendency to dropsical effusions may be mainly due to the hydræmic state of the blood. On the side of the nervous system, headache, vertigo, tinnitus, and—in cases of acute anæmia—convulsions mark the effect of impoverished blood on the cerebral circulation and nutrition. Digestion is impaired and enfeebled, and all the functions of the body are deranged. (For further detail, *vide* CHLOROSIS.)

Treatment of Anæmia.—The removal of the cause of the anæmic state is the first object. The arrest of hæmorrhage, subdual of fever, &c., and removal into pure air are thus essential. But when the cause cannot be removed, then measures have to be directed to maintain the strength and to treat the primary disease. Food should be peptonized, and, if the stomach be intolerant, nutrient enemata or suppositories may be resorted

to. Medicinally, iron and arsenic are the chief hæmatinic remedies. In acute cases the best results are obtained from transfusion, either direct of blood, or indirect of defibrinated blood, or by Nussbaum's plan of "auto-transfusion." Very good results have been gained by the injection of saline fluid into the veins, in saving from impending death. Transfusion of milk or of lamb's blood has been shown to have had injurious effects, and has been consequently abandoned.

SIDNEY COUPLAND.

ANÆMIA, PERNICIOUS.—A severe and almost invariably fatal form of progressive anæmia, the existence of which was first made known by Addison in 1855, and the pathology of which has still to be determined.

It is still a moot point whether the condition can be regarded as a distinct disease or only as the final and most serious grade of anæmia no matter how arising. For it must be borne in mind that, in certain diseases of which anæmia forms the most prominent symptom, the clinical phenomena are closely paralleled by those of this so-called "idiopathic" affection—*e.g.*, latent cancer of the stomach; and the post-mortem evidences (except those strictly due to the local and primary malady) are attributable to the persistent and progressive anæmia.

Again, there are cases—those of anchylostomiasis—which for a long time were thought to be idiopathic, but which are now known to be due to the presence of an intestinal parasite, the anchylostomum duodenale. This worm induces hæmorrhage, and consequent anæmia, which may be recovered from on expulsion of the parasite by appropriate remedies. Other intestinal parasites—*e.g.*, bothriocephalus—have of late been credited with being the cause of progressive and fatal anæmia; but obviously their *modus operandi* (if such relationship do exist) must differ from that of the bloodsucking nematode. Still, it may be fairly maintained that in all such cases, whether due to the interference with digestion and assimilation, or to continued small hæmorrhages, or to the action of intestinal parasites, the anæmic state thus brought about can only become progressive and pernicious by the entrance of another factor—a factor which in many cases seems to be introduced without any satisfactory cause, or, at any rate, apart from any of the well-

recognized causes of anæmia. Hence the endeavour to ascertain the existence of lesions in the hæmato-poietic organs adequate to account for the occurrence of this condition. At one time much attention was paid to certain changes in the bone-marrow which are undoubtedly present in many cases. It was found to be red, and full of immature forms of corpuscular elements. Then the spleen and liver were found to contain an excess of iron in their composition, and iron was even found in the urine. This character seems to be the most common in all cases of pernicious anæmia, especially as regards the liver, and the recent researches of Dr. William Hunter have gone far to place the question on a sounder basis. For, both experimentally and by examination of organs in cases of pernicious anæmia, he has shown that the condition is largely one of excessive hæmolysis; and its pronounced seat in the liver suggested the further not unreasonable hypothesis that the process is initiated by the absorption into the portal blood of ptomaines generated in the intestinal tract. It is remarkable how closely at this point such a doctrine approximates to the views of some writers upon the fæcal origin of chlorotic anæmia; and yet in very few cases does chlorosis merge into pernicious anæmia. Rather it would seem as if, pathologically speaking, chlorosis were mainly due to defective blood formation (hæmogenesis), pernicious anæmia to excessive blood destruction (hæmolysis).

The use of the term "pernicious" as descriptive of this disease (or condition) is unfortunate, but has been sanctioned by usage. It implies a malignant or invariably lethal course; although this may be true of most cases, it is not of all, and it would be a novelty in nomenclature to distinguish a disease solely by its incurability. Happily, there are cases which are undoubtedly of this category that do recover, not only temporarily, but even permanently. The alternative titles of "essential anæmia" and "idiopathic anæmia" are, however, quite as much open to criticism, since they do not discriminate between this affection and chlorosis.

Each sex would appear to be about equally liable to pernicious anæmia, although in the experience of the writer the males far outnumber the females. But abroad, especially in Zürich, the number of cases among pregnant or puerperal women seems unusually high, whereas in this country such a relation-

ship is not common. It may be that other factors, especially the mode of life and diet, play some part in accounting for this discrepancy. It is a disease of early adult life, most cases occurring between thirty and forty, but it is not unknown in youth before puberty, or in the aged.

Pernicious anæmia is for the most part insidious in onset, although there are cases where it has immediately followed a violent emotional influence or shock; and occasionally a sudden profuse hæmorrhage will leave behind it an anæmia that progressively advances in all respects like the idiopathic disease. Usually, however, its course is rather chronic than sub-acute, extending over months or even years, and the subject may or may not have been previously anæmic.

The *symptoms* of the declared disease are those of intense anæmia. Frequently vomiting and diarrhœa are early symptoms, and there may even be slight icterus, not to be confounded with the faintly icteroid tint of skin due to the profound anæmia. There is breathlessness, which in time becomes marked, even when the patient is at rest. Palpitation, vertigo, tinnitus, tendency to syncope, and other symptoms referable to the anæmic state are prominent. There is frequently marked œdema, especially in dependent parts, but the general nutrition of the body is maintained. Indeed, there is mostly a fair amount of subcutaneous fat. The cardio-vascular signs of anæmia are well marked, bruits in the precordial region being often very loud, and the jugular hum intense. Hæmorrhages, especially retinal, are common and fairly diagnostic; they may also occur subcutaneously, whilst occasionally there is bleeding from mucous surfaces—as epistaxis, hæmatemesis, menorrhagia. These hæmorrhages, which serve to intensify the anæmia, are doubtless due to the altered composition of the blood and the defective nutrition of the vessel-walls. The blood is markedly altered. Besides pronounced oligo-cythæmia—to 20 or 15 per cent. of the normal, with a proportionate reduction in the amount of the hæmoglobin—the red corpuscles are much altered. Not only do they not form rouleaux, but they exhibit numerous microcytes and misshapen forms (poikilocytes) to a degree not exhibited in any other condition. The urine is usually pale, and deficient in normal pigment, but it has been found to contain iron and an excess of indican. Albuminuria is occasionally

present. There is often marked pyrexia of irregular type.

Death occurs from exhaustion, being sometimes preceded by obstinate vomiting or by severe dyspnoea with irregular breathing of the Cheyne-Stokes type.

The *post-mortem appearances*—beyond the striking pallor of all the organs and an excess of thin limpid effusion in the serous sacs—are mainly those of fatty degeneration. This is seen to its best marked degree in the heart, of which the muscle is pale and the musculi-papillares exhibit the “tabby-cat” striation due to extreme fatty change. Similar fatty patches are to be seen in the lining membrane of the aorta and other vessels. The spleen is mostly small and bloodless; in a few cases (which have been distinguished as splenic anæmia) it may be soft, swollen, and the Malpighian bodies prominent. The liver is rather large, and exhibits often undue pigmentation combined with fatty degeneration. Its excessive contents in iron have been already noted. The kidneys are pale but otherwise normal; the lungs pale and cedematous. Petechial hæmorrhages may be seen beneath the pleura and pericardium, and in the substance of the liver and kidneys, as well as in the retinae.

The *treatment* of pernicious anæmia is not hopeful; yet undoubtedly there are cases which have presented all the symptoms of the disease, including even retinal hæmorrhages, which have been apparently cured. It may often be doubted whether the cure is permanent, for it is not an unusual feature of the affection for a temporary improvement to take place. The signs of improvement consist not only in the disappearance of pallor and of the subjective phenomena, but in the gain in corporeal richness and fading of the hæmic bruits. Besides absolute rest in bed and the administration of easily digested foods (where there is vomiting and other dyspeptic signs the food should be peptonized), the most reliance is to be placed on the administration of arsenic. This remedy may be given as Fowler's solution or in a pill of arseniate of iron by the mouth, or by means of subcutaneous injection of the former. Arsenic is the only drug that has been known to have exerted any good effect, for iron almost invariably fails. A case has been recorded of idiopathic anæmia in the adult where iron succeeded after the failure of arsenic, but this is quite exceptional. In this respect pernicious anæmia contrasts with chlorosis. It constitutes the most notable difference

between the two affections. Transfusion of blood or of saline fluid has been tried with variable result, the best results being those recorded by Quincke.

SIDNEY COUPLAND.

ANASARCA signifies the presence of serous fluid in the subcutaneous areolar tissues. When present throughout the body the person is said to have general anasarca; or if, as is probable in such circumstances, there is also effusion into the great serous cavities—*e.g.*, the peritoneum and pleura—he is said to have general dropsy. The commonest cause of general anasarca is some form of nephritis, either acute or chronic, in which case it is generally first seen and is always most marked in those parts where the skin is very loose, as beneath the eyes and in the scrotum; but general anasarca may also be met with in cases of heart disease, when it commences in the most dependent parts of the body—in the legs if the person is up, in the lower part of the back if he is confined to bed. Chronic lung diseases are sometimes attended with anasarca; in such cases there will generally be found some dilatation of the heart. In anæmia, scurvy, and after long-continued diarrhoea in children anasarca is not infrequently seen, whilst sometimes no definite cause can be found. Various views are held as to the cause of the anasarca in renal disease—(1) That it is due to the impoverishment of the blood by the loss of albumen; (2) That the deficient excretion of water by the kidneys is the main fact in its production; (3) The theory of Cohnheim, that the vessels of the skin and subcutaneous tissues become altered by the same cause which induces the disease of the kidneys. Further researches are necessary in order to determine the question. In heart disease it is, in great part at any rate, due to mechanical causes. A part affected with anasarca is always swollen; the skin is often tense and shiny, and always pits on pressure, a condition for which the term *œdema* is now reserved. Local anasarca is generally mechanical and due to obstruction to the return of blood from the part affected. Phlegmasia alba dolens, the white leg seen after parturition and in other conditions, is the most common instance of local anasarca, and is due to thrombosis of the femoral vein. In gouty subjects patches of anasarca (local œdema) are not infrequently met with, and are probably due to some vasomotor disturbance, to which cause also

may be attributed the swelling of the hands and feet seen in tetany and some other forms of nervous disease.

ANEURYSM may be defined as a local dilatation of an artery, usually containing fluid or clotted blood, or both. The older writers classified aneurysms according as they were *true* or *false*, all the coats of the vessel persisting in the former, and one or more having suffered rupture in the latter. The tendency now, however, is to regard the distinction as useless, and to confine the name *false* aneurysm to one in which the rupture of all the coats has taken place, and the effused blood is limited by the condensed tissues around the rupture, and not by any of the coats of the vessel itself. This would correspond to what has been described as the *diffused* or *consecutive* aneurysm. As regards shape, the distinction of *fusi-form* aneurysm and *sacculated* aneurysm is a convenient one. The former presents a spindle-shaped dilatation of the artery; the latter springs like a pouch or bag from its side, and communicates with it by an opening which may be relatively large or small according to circumstances.

Another variety which may be mentioned is the *dissecting* aneurysm, whose seat is primarily the aorta. Here the internal coat is ruptured, and the blood forces its way between the fibres of the middle coat and distends the outer part of it and the external coat into a kind of aneurysmal dilatation. Commencing in the aorta, it may extend into its branches, and in some cases the blood finds its way back into the artery at a lower level, and the aneurysm thus becomes a permanent channel.

The following varieties do not conform to the strict definition of aneurysm; but, inasmuch as they are called aneurysms, a brief reference to them is necessary:—

Arterio-venous Aneurysm.—This condition results from the establishment of an abnormal communication between an artery and a vein. It may occur spontaneously, but is most frequently the result of unskilful venesection, its most frequent seat being the bend of the elbow. In some cases the communication between artery and vein is direct; in others a sac intervenes. In the former case the artery is comparatively little changed, but the vein is dilated, tortuous, and pulsating. To this the name *aneurysmal varix* is given. When an actual sac exists between the vein and artery it is termed a *varicose aneurysm*.

Cirroid Aneurysm and Aneurysm by Anastomosis.—The former consists in lengthening and dilatation of a portion of an artery which becomes convoluted in the same way as a varicose vein. The arteries of the neck, the temporal, and the occipital are the vessels most commonly affected.

In aneurysm by anastomosis a large number of small arteries are involved together with veins and capillaries, the whole forming a pulsating tumour under the skin. Its favourite seat is the scalp.

Symptoms and Diagnosis.—The cardinal sign of aneurysm is a localized pulsating swelling where no such condition should be found. But there may be aneurysm in the interior of the chest where no tumour can be detected, its presence being merely inferred from its pressure effects; and, conversely, tumour and pulsation may exist apart from aneurysm, as in the case of some new growth overlying an artery and receiving a communicated pulsation from it. One chief sign is relied upon for differential diagnosis in the latter case. The aneurysmal swelling is expansile, being distended in all directions by the blood pressure; the other is not. If the artery on which an aneurysm is situated can be efficiently compressed above the tumour, the pulsation ceases, and the tumour shrinks in bulk, a contrary effect being sometimes produced by compression applied to the vessel below the tumour. On auscultation over an aneurysm a bruit is generally, but not always, heard. The remaining signs are principally those produced by the pressure of the aneurysmal swelling, as, for instance, in the case of the thoracic aorta. Pain is one of these, and it is sometimes very severe. Its exact seat depends on the direction in which the tumour extends. Dyspnoea may result from pressure on the trachea or on a bronchus; dysphagia from pressure on the oesophagus; laryngeal paralysis or laryngeal spasm from pressure on the recurrent laryngeal or pneumogastric nerve; changes in the pupils from pressure on the sympathetic.

Ætiology.—Two conditions, speaking generally, are potent factors in the causation of aneurysm—namely, weakening of the coats of the vessel and increased blood pressure. The weakening may be the result of atheroma, which is the commonest antecedent, or of syphilis. The increased blood pressure is provided by the strain of sustained physical exertion, such as may occur in those who row races; in soldiers, hampered with their

clothing and accoutrements, making forced marches; or in the case of blacksmiths using heavy hammers, or workmen who have to lift heavy weights. Alcoholism acts in both ways, inducing degeneration of the vessels and causing an increase in the force of the circulation. Gout also operates as a cause, owing to the degeneration of the arterial system which it induces. The male sex suffers from aneurysm more than the female, because the above mentioned causes of the disease are more widely operative in the male. Embolism must also be mentioned as a cause; and external violence, inducing rupture of one or more of the coats of an artery, or setting up an inflammation which weakens its wall, is another.

Morbid Anatomy and Pathology.—The inner coat of the artery, having become weakened by any of the causes above referred to, gives way, and a gradually increasing pouching of part of the vessel takes place by the distending force of the blood-stream. According as the aneurysm takes the fusiform or sacculated shape the internal coat may be found lining its whole extent, altered, indeed, but still traceable, or it may exist only in patches. The middle coat may also in great part disappear. The external coat, on the other hand, becomes thickened by inflammatory changes, and forms adhesions with surrounding structures. In the interior of the sac numerous patches of atheroma are seen causing irregularity of the surface; and generally some stratified coagula are found more or less firmly adherent to the wall of the sac—a natural effort towards spontaneous cure. The more sacculated the type of the aneurysm the more abundant is this clotting, as the blood is kept less actively in motion, and the comparative rest favours the deposit of fibrin on the roughened wall.

Prognosis.—Although spontaneous cure sometimes occurs, the progress of the disease is in the great majority of cases towards a fatal termination unless it can be effectually dealt with. The aneurysmal tumour gradually increases in size until it either bursts externally or internally, the latter the more frequently; or it brings about the fatal result by pressure on some important organ.

Treatment.—In the case of arteries which are easily accessible to surgical procedure (*e.g.*, in the limbs) the most rapid and complete method of treatment is by ligature on the proximal side of the aneurysm. But the larger internal vessels are not amenable to this mode of treat-

ment, and here rest, restricted diet (Tufnell's treatment), and iodide of potassium (in doses of grs. xx ter die, gradually increased), are the chief agents on which reliance is to be placed. These all act by reducing blood pressure, and in addition the iodide is supposed to increase the coagulability of the blood. In cases having a syphilitic ætiology it also exercises a specific effect on the arterial wall weakened by syphilitic changes. Pressure upon the vessel on the proximal side of the aneurysm has also been employed both by means of the fingers of a relay of assistants and by mechanical appliances, the circulation of blood through the sac being thus stopped and coagulation induced. Other methods of treatment are by galvano-puncture, and, in the case of aortic aneurysms, by distal ligature of vessels given off beyond the aneurysm; also by the introduction into the sac of wire or some other foreign body on which coagulation may be started. Still more recently Dr. Wm. Macewen, of Glasgow, has treated aneurysms by inserting long slender needles into the sac in such a way that they scratch its wall and cause clotting of the contained blood.

DAVID W. FINLAY.

ANGINA, a word used by the old writers to signify an affection of the throat, and applied indiscriminately to a difficulty in swallowing and a difficulty in breathing. It is synonymous with cynanche, and, like it, is now seldom employed in its original sense.

ANGINA PECTORIS is the name given to an affection of which paroxysms of agonizing pain in the cardiac region and a sense of impending death are the distinguishing features. Lesions of the heart and aorta are generally, but not invariably, present. Angina pectoris is very uncommon before the age of forty, and is of more frequent occurrence in the male than in the female sex.

Symptoms and Course.—The pain commences in the first instance with great suddenness, as the result of some slight exertion, a full meal, exposure to a cold wind, emotional excitement, &c. Subsequent attacks are very liable to arise on still slighter provocation, and may develop during sleep, or without any obvious cause. Vague premonitory sensations in the præcordial region occasionally precede an anginal seizure. Patients describe the pain as stabbing, gnawing, tearing in character, or com-

pare it to the sensations of the chest being grasped in a vice. Others say that no words can express the agony they experience. The pain is usually referred to the lower end of the sternum, or somewhat to the left of this point, more rarely to the right mammary region. As a rule the pain is not confined to the sternal region, but spreads over the front of the chest, and shoots back to the left shoulder and inner aspect of the arm, sometimes passing down to the tips of the fingers. It may also radiate to both arms, to the diaphragm, neck, and occiput, and occasionally, in cases of extreme severity, it travels down to the testes and lower extremities, and may extend to all parts of the body. In exceptional instances the pain shoots to the right arm alone, and still more rarely it commences in the left hand or arm, and spreads upwards to the præcordia. A sensation of numbness or tingling is sometimes associated with the pain when it radiates to distant parts.

Cutaneous hyperæsthesia and numbness in the region of the heart have been noted in different cases. When patients are seized with angina pectoris, they generally remain rooted in the position in which the attack surprised them, for fear of increasing the pain. In other instances they assume various postures that seem to them to give relief—*e.g.*, on all fours, leaning over the back of a chair, standing upright, &c. The sensation of dying is very characteristic of the classical type of the affection, and is probably connected with the severity of the pain. The heart's action is usually somewhat increased in frequency. The pulse may be weak, irregular, and intermittent, and occasionally becomes very infrequent. In some instances the tension of the radial pulse has been found to be distinctly increased. But, on the other hand, cases have been observed where the heart's action and the pulse have been quite unaffected. The respiration, as a rule, shows no important alteration, and there is no true dyspnoea, though a sense of oppression or suffocation is sometimes experienced. Most patients are afraid to breathe deeply, and the respiration becomes shallow and slightly hurried in consequence. In exceptional instances a full inspiration has been found to give relief.

During the paroxysm the patient may feel faint and giddy, and convulsions are stated to occur occasionally, but with rare exceptions consciousness is preserved. The skin is pale, cold, and

bedewed with a clammy sweat, and the face betrays the greatest anxiety. Eructations, flatulence, vomiting, difficulty in swallowing and phonation, and a constant desire to micturate are occasional accompaniments of angina pectoris, and the termination of the attack may be marked by the passage of a large quantity of limpid urine. The paroxysm usually ends as suddenly as it begins, but at times it passes off more gradually. Anginal seizures may last a few seconds or minutes, or they may be prolonged for half an hour or even longer, and in such cases they probably consist of a succession of paroxysms.

The severity of the pain varies greatly in different attacks. At times a brief spasm of pain may alone be felt, whereas on another occasion the agony may be so intense that it leaves behind it a state of profound exhaustion. The patient may die in the first attack, or he may recover and remain free for years, and, it is said, for the rest of his life. Far more often the paroxysms show a tendency to recurrence, the pain becoming more severe, and the attacks more frequent. During the intervals the patient is free from anginal symptoms, and, except in those cases where organic disease is present, there may be no derangement of the general health.

Angina pectoris is very liable to end fatally. In a relatively large proportion of cases death occurs suddenly during an attack, but, according to Balfour, gradual failure of the circulation is the more usual mode of termination.

The account that has just been given deals with the classical type of angina pectoris, depicted by Heberden and Latham, in which a fatal termination within a few years is the rule and not the exception. Some writers, especially in Germany and France, use the term in a wider sense, and include a somewhat different class of cases, which, however, in point of symptoms resemble the classical form very closely. The pain is less severe, the tendency to radiation is less pronounced, and there is not, as a rule, the same overwhelming sense of approaching death.

This variety, described as "pseudo-angina" by Walshe and others, occurs in young persons, and especially in anæmic or neurotic females. Moreover, in these cases there is no organic cardiovascular disease, and there is little or no tendency to a fatal issue.

The "angina pectoris vasomotoria" of Landois and Nothnagel requires a brief

notice. In this affection the attack is usually attributed to cold, and begins with pain, numbness, and coldness of the extremities, followed by a sense of oppression and palpitation, dull pain in the cardiac region, which may spread over the left side of the thorax to the arm, pallor of the face, cyanosis of the fingers and toes, and cold clammy perspiration. The action of the heart is at times excited, and the pulse is small and tense. A sense of anxiety or apprehension may be experienced, but this symptom is usually a subordinate one, and no danger to life is to be feared. The paroxysms are relieved by friction, and by the application of warmth to the extremities. It is doubtful whether this disorder really deserves the name of angina pectoris. At the same time it shows that a peripheral vaso-motor spasm may give rise to a certain amount of cardiac pain, if not to the characteristic agony of a true anginal seizure.

Pathology.—Morbid anatomy throws a somewhat uncertain light on the pathology of angina pectoris. The heart is generally in a flaccid, uncontracted, or dilated state, and may present various structural changes in its walls or valves. The most frequent lesion is atheroma of the coronary arteries, or of the root of the aorta, involving the orifices of the coronary arteries. Fatty and other degenerative changes, atrophy and dilatation of the heart, aneurysm or dilatation of the arch of the aorta, and disease of the aortic valves have all been found in different cases, but no single lesion has been constantly present. A marked degree of hypertrophy is rarely met with. Walshe says that he has never known angina to occur in association with mitral disease. In a few instances anatomical changes have been detected in the nerves forming the cardiac plexus. It is said that in some fatal cases the heart and arteries have been free from disease.

The importance of these morbid conditions is somewhat difficult to estimate.

Atheroma of the coronary arteries is a very common disease, and the same may be said of the other lesions that have been mentioned, but it is only in very few instances that they are complicated by angina. It is clear, therefore, that none of these conditions alone can account for an attack of angina pectoris.

The paroxysmal and capricious nature of the affection, the suddenness with which the pain begins and ceases, the development of an attack in response to such slight reflex impulses as the act of

swallowing a draught of cold water, and the characteristic radiation of the pain are facts highly suggestive of a nervous origin. Trousseau, indeed, regarded angina pectoris as an epileptiform neuralgia. But, although no explanation is possible without invoking the influence of the nervous system, it appears that angina pectoris, in its severe form at least, is not a pure neurosis, but is rather a neurosis grafted upon an organic basis.

Heberden's original idea that the affection is due to a spasm of the heart is inconsistent with that author's statement that the pulse is unaffected, and with the relaxed condition of the heart so generally found after death. It has been suggested that the pain is the result of the strain to which the heart is subjected in its attempts to overcome increased peripheral resistance. But the sudden onset of the attack, without previous signs of cardiac derangement, and the absence of any excessive action of the heart, seem to negative the idea of an acute distension of the heart.

This explanation has been adopted by Nothnagel, with good reason, for his cases of angina pectoris vasomotoria, in which the cardiac symptoms are clearly secondary and subordinate to the peripheral vaso-motor spasm.

Brunton's observations show that in some cases the arterial tension is increased at the commencement of an anginal attack, the rise in blood pressure being due, in his opinion, to widespread vaso-motor spasm. The signal relief which he obtained by means of nitrite of amyl, which dilates the small vessels and reduces arterial tension, affords a strong support to his views as to the important influence of blood pressure in determining a paroxysm of angina. What causes the irritation of the vaso-motor nervous system on which the increased arterial tension is believed to depend has not yet been ascertained. Subsequent experience has fully confirmed Brunton's estimate of the great efficacy of nitrite of amyl in the treatment of anginal attacks, although it does not afford relief in all cases.

The manner in which vaso-motor spasm and high arterial tension induce a paroxysm of angina is not very clear. The increased intra-cardiac pressure which results from a rise of blood pressure cannot alone be the cause of the seizure, nor is it easy to see how a spasm of the coronary arterioles, if such there be, can produce such an effect. On the other hand, it is quite possible that both

conditions may precipitate an attack in certain impressionable states of the cardiac nerves.

Balfour holds that a defective supply of blood to the myo-cardium is a potent element in the causation of cardiac pain and angina pectoris. Obstructive disease of the coronary arteries and spasmodic contraction of those vessels would equally tend to produce anæmia of the cardiac walls, and would therefore act as predisposing causes.

From the proximity of the cardiac plexus to the arch of the aorta, and from the distribution of the coronary plexus in the course of the corresponding arteries, the cardiac nerves are liable to become implicated in morbid processes affecting the walls of these vessels and this circumstance has been thought to have some bearing on the pathology of angina.

On the whole, it seems probable that the essential element of a paroxysm consists in some abnormal condition of the cardiac plexus: in other words, that angina pectoris is a neurosis or cardiac neuralgia, but that vaso-motor spasm is very frequently connected with the development of an attack in some manner not as yet understood.

This view would admit the existence of a close relationship between the severe organic form and the functional or false angina. The fact that the danger to life differs widely in the two varieties is not incompatible with their essential unity, for degenerative changes in the heart's walls and insufficient coronary circulation may well account for the greater danger of a paroxysm in the organic form, the shock caused by the intensity of the pain being more likely to cause fatal inhibitory arrest of the heart's action when the organ is structurally unsound.

The characteristic radiation of anginal pain is to be explained by the numerous connections of the cardiac nerves with the brachial plexus and with the upper four cervical nerves. The tendency of the pain to spread to the left arm by preference is not easy to account for, as the cardiac plexus derives branches from both sides of the body.

The *ætiology* of angina pectoris is extremely obscure. The influence ascribed to gout and various other diseases does not seem to rest on very strong evidence. The greater proclivity of the upper classes to angina has probably been over-stated by some writers. Some cases of the functional variety occurring in

young men have been traceable to the abuse of tobacco.

Diagnosis.—The diagnosis of the severe classical type of angina presents little difficulty. The character and localization of the pain, its sudden onset and disappearance, its tendency to radiate to the left shoulder and arm, and the sense of impending death constitute a group of symptoms that can hardly be mistaken. If, at the same time, the patient be above the age of forty, and present evidence of organic disease of the heart or aorta, a positive diagnosis may be given. The absence of signs of cardiovascular disease must not prevent us from diagnosing angina pectoris in a person past middle life, for the detection of coronary or myo-cardiac disease is often quite impossible.

Attention should be particularly directed to the age, and in a less degree to the sex of the patient. It must, however, be remembered that the severe type of angina may occasionally occur in young persons, as shown by the fact that a patient of Balfour's, a young man of twenty-four, died suddenly in an attack, and the diagnosis of atheromatous obstruction of the coronary arteries was confirmed at the necropsy.

The recognition of pseudo-angina is not always easy, though the age and sex of the patient and the character of the paroxysm will often enable us to make a correct diagnosis. It is of great importance to distinguish the organic from the functional form of angina; but in some cases this is impossible, and fallacies are especially likely to arise in the case of attacks occurring in women about the period of the climacteric.

Prognosis.—The prognosis of the organic variety is decidedly unfavourable, though in such cases life may occasionally be prolonged for years. Where there is reason to believe that the symptoms are due to pseudo-angina the prognosis is favourable as regards the duration of life; but in no case should a too sanguine opinion be expressed, in view of the difficulty of distinguishing the organic from the functional form under certain circumstances.

Treatment.—For the actual paroxysm, nitrite of amyl, as recommended by Brunton, gives the most prompt results in most cases. Glass capsules, containing a few drops of the drug, should be broken in a handkerchief, and the vapour should be inhaled until relief is obtained. Nitro-glycerine, introduced by Murrell, is another valuable remedy,

and may be given internally in doses of 1 minim of a 100 per cent. alcoholic solution three or four times a day, or oftener, the quantity being gradually and cautiously increased if necessary. Nitro-glycerine may also be conveniently exhibited in the form of tablets. The combination of nitro-glycerine with ether and ammonia gives good results where the heart's action is weak; in other cases the drug may be advantageously prescribed with peppermint if flatulence be a troublesome symptom. Nitrite of sodium is believed to act in the same way as nitro-glycerine. The inhalation of amyl-nitrite generally gives the speediest relief, but a regular course of nitro-glycerine not infrequently renders other measures unnecessary. The administration of this remedy in small doses frequently repeated is generally to be preferred to the use of large doses at longer intervals. In severe cases the patient should always carry about with him some capsules of amyl-nitrite. The good effects of the nitrites are not confined to the severe organic form of angina, but are manifested in some cases of the functional variety also.

Where these remedies fail, Balfour recommends the inhalation of chloroform followed by a hypodermic injection of morphia. Numerous other medicines have been advocated, but arsenic and iodides are, perhaps, the only ones that appear to have much effect, and these drugs are greatly inferior in their action to the nitrites or morphia. The application of the constant current to the sternum has proved successful in a few instances, but electrical treatment would only be justifiable in the comparatively rare cases in which we can exclude organic disease. The general treatment of angina pectoris consists in the avoidance of everything that may predispose to an attack, such as exertion, emotional excitement, digestive disturbances, cold, &c. Regulation of the bowels is of great moment, as paroxysms of angina are not infrequently excited by straining at stool. Iron, strychnine, arsenic, and remedies directed to the improvement of the digestion will be useful in suitable cases. The meals should not be large, and should consist of light, digestible food. Rest, both of mind and body, is an essential element in the treatment. The abuse of tobacco must be avoided. Anæmia and disorders of the nervous system must be dealt with on general principles.

PERCY KIDD.

ANODYNES are remedies, acting through the medium of the nervous system, which relieve or allay pain. The chief of these is opium, including the various preparations made from it or its alkaloid, morphia. Amongst the others are cannabis indica, belladonna, hyoscyamus, stramonium, conium, veratrum, lupulus, gelsemium, bromide of potassium hydrate of chloral, chloroform, ether and camphor.

ANOREXIA signifies loss or impairment of appetite, and is met with in many forms of gastric disorder, as well as in most febrile affections and in chronic disease.

ANOREXIA NERVOSA (*Apepsia Nervosa vel Hysterica*), a condition characterized chiefly by extreme emaciation, owing to abstinence from food, and occurring chiefly in neurotic females between the ages of sixteen and twenty-three, but occasionally met with in males at about the same period of life. It was first clearly described by Laségue in 1873. Sir William Gull about the same time also drew attention to the disease (*Clin. Soc. Trans.*, 1874), and ascribed it to a "failure of power of the gastric branches of the vagus." Anorexia nervosa has close relations with hysteria and neurasthenia.

Symptoms.—The patient becomes fearfully emaciated, the eyes sunken, the skin cold and of a sallow tint; there is no desire for food, and but little is taken except upon compulsion. The mind is not weakened; there is no craving for sympathy, rather an inclination to reserve and seclusion; the mental state is one of "inexhaustible optimism" (Laségue), with restlessness and a marked desire for walking exercise and capacity for undertaking it without apparent fatigue.

The pulse and respiration are slow; there is generally obstinate constipation, and in women amenorrhœa and an arrest of fecundity. Gastralgia, vomiting, and hæmatemesis may be present.

The *prognosis* is generally favourable, but some cases have terminated fatally from extreme inanition.

No changes have been found in the stomach or elsewhere which throw any light upon the pathology of the condition.

The *diagnosis* from gastric ulcer, cancer, or abdominal tuberculosis is in many cases most difficult.

Treatment.—The patient should be removed from the care of sympathizing

friends, and a trial given to the Weir Mitchell treatment (seclusion, massage, and excessive feeding). Most cases recover so soon as they begin to take food. No drugs have been found of much use.

ANOSMIA is loss of the sense of smell—either uni-lateral or bi-lateral. It may be due to local disease affecting the mucous membrane of the nose, to injury or disease of the fifth or olfactory nerves, to disease involving the inner and lower parts of one or both anterior lobes of the brain, the olfactory bulbs, the under surfaces of the temporo-sphenoidal lobes (Ferrier), or part of a hemi-anæsthesia of either organic or hysterical origin. When anosmia is complete, taste, except for bitter, sweet, sour, and salt substances, is also lost.

ANTACIDS are given to correct excessive acidity of the stomach, whether due to the secretion of too abundant or too acid a juice, as in acute dyspepsia, or to the decomposition of food from impaired digestion. They are usually given after meals. The alkalies and their carbonates are the chief antacids, soda salts being preferable to potash, but when there is diarrhœa the lime salts should be used.

ANTHELMINTICS are of two kinds, those which simply expel the worms (vermifuge)—to which class almost all the purgatives belong, scammony and jalap being the most popular—and those which kill the worm (vermicide). Male fern, pomegranate root, kamela, koussou, turpentine, and tannate of pelletierene are all used against tape-worms. Santonin acts especially on round worms, whilst thread-worms are best destroyed by small injections into the rectum of salt and water or infusion of quassia; the latter, in combination with iron, may also be given by the mouth.

ANTIMONY, Poisoning by.—The chloride of antimony, or butter of antimony, is a violent irritant poison, but one very rarely taken. The potassio-antimonio-tartrate, or tartar emetic, is the better known. It produces a metallic taste, followed by a whitish appearance of the mouth, nausea, vomiting, and purging, with pain in the abdomen, heat and constriction of the throat, cramps in the limbs, cold sweats, great faintness, and weakness; the pulse becomes very feeble, the eyes sunken, and the voice reduced

to a whisper; death may ensue from exhaustion with or without convulsions. There are no remissions, and the general depression is greater than in arsenical poisoning, to which otherwise the symptoms have much resemblance. If small and repeated doses of the poison have been given there will be vomiting and distension of the abdomen, purging, and perhaps blood in the motions; a pustular eruption occasionally appears.

Post-mortem Appearances.—The contents of the stomach and intestines present a white or yellowish pasty appearance, and the mucous membrane may be more or less inflamed. The large intestine may be affected even when the small is found healthy; the liver may be fatty; the blood is generally fluid.

Treatment.—The stomach should be thoroughly washed out with the stomach-pump and vomiting encouraged in every way; milk and water should be freely administered; astringent infusions—*e.g.*, tannic acid (gr. 30) in solution—may be given as antidotes; strong coffee and ammonia are useful if there be collapse.

ANTIPERIODICS check or cut short the attacks of those diseases which tend to recur in paroxysms. The various forms of intermittent fever due to malaria constitute the chief class, but certain kinds of headache and neuralgia must also be included. Cinchona bark and its alkaloids, especially quinine, are by far the most important of the antiperiodics. Salicin, salicylic acid, and arsenic are also used.

ANTISPASMODICS are used to relieve or prevent spasm. The diseases which call for this class of remedies are most varied. Convulsions, laryngismus, asthma, angina pectoris, hiccup, dyspepsia, colic, hysteria, are instances. Antispasmodics may produce their effects either by direct local action or through the medullary centres. Bromide of potassium is the most important. The other bromides, opium, belladonna, stramonium, Indian hemp, ether, alcohol, nitrite of amyl, musk, valerian, assafoetida, camphor, and the volatile oils are also useful in various disorders, on reference to which the appropriate remedies and their doses will be found.

AORTA, DISEASES OF THE.—The aorta is specially liable to several of the diseases of an inflammatory and degenerative kind which are described in the article on diseases of the arteries—

namely, acute and chronic endarteritis, fatty degeneration, and calcification (*see* ARTERIES, DISEASES OF). In addition may be now mentioned stenosis of the aorta, simple dilatation and aneurysm, the last named being, of course, by far the most important.

Stenosis.—Stenosis, or narrowing of the aorta, also called *coarctation*, may be either a congenital malformation or an acquired condition. In the former case the narrowing is found close to the point where the vessel is joined by the ductus arteriosus. The amount of narrowing may be trifling, but if considerable the aorta and its branches on the proximal side are greatly enlarged. Beyond the narrowing, the vessel may be either of normal size or formed by vessels smaller than natural. The circulation is carried on by collateral channels, which become greatly increased in size. The enlargement of the vessels about the root of the neck, together with a murmur over the aorta, may suggest a correct diagnosis; but the condition is generally discovered only on the post-mortem table. In cases where the stenosis is acquired, it results from the thickening and projection into the lumen of the aorta of atheromatous or calcareous patches, which may be covered with thrombi.

Simple Dilatation.—This condition occurs chiefly in the subjects of chronic interstitial nephritis. It is caused by the extra strain thrown upon the aorta by the resistance to the circulation in the peripheral vessels, and the increase in force of the impact of blood against the wall of the artery resulting from consequent hypertrophy of the left ventricle. It is also found in cases of incompetence of the aortic valve, the force of the current of blood propelled by the hypertrophied left ventricle being alone sufficient to cause it in this case. The ascending portion of the vessel is the part principally affected. In some cases it is possible to make out by percussion that the aorta is dilated, and the second sound in the aortic area is usually accentuated and of a ringing character.

Aneurysm.—Aneurysm of the aorta is a localized dilatation of the artery. The dilated part, called the sac, contains during life either fluid or clotted blood, sometimes both. Aortic aneurysms may be divided into two classes according as they are situated in the thoracic or abdominal portion of the vessel. A further convenient division is made, in the case

of the thoracic aorta, into aneurysms affecting the ascending, the transverse, and the descending portions respectively.

As regards anatomical characteristics, the principal forms are the sacculated and the fusiform, and it is the former which contains coagulum, the circulation through the other being too rapid to permit the deposit of fibrin on its walls. A fusiform aneurysm may, however, also become in part sacculated, so that both conditions may co-exist in a given case. Other varieties will be found referred to in the article on ANEURYSM. One of these may be mentioned here—namely, the *varicose aneurysm*, in which a communication is found between the aorta and the vena cava, pulmonary artery, or one of the chambers of the heart. This kind begins as an aneurysm of the aorta, and, by pressure against one or other of the parts named, adhesive inflammation is set up, and then a perforation of the wall of each establishes a communication between them.

SYMPTOMS AND DIAGNOSIS.—I. *Thoracic Aorta.*—A. *Ascending Portion, Aneurysm of.*—This is generally the most easily recognizable form of aortic aneurysm, at least when it has progressed to any extent. There is one exception to this rule, however—namely in the case of aneurysm situated in the sinuses of Valsalva, which causes, from its position, no signs distinguishable from those of aortic valvular disease. It never reaches a size sufficient to produce an obvious tumour, and it causes death by rupture into the pericardium. In the more usual seat, higher up the vessel, the aneurysm presses forwards toward the chest-wall, and soon appears to the right of the sternum, about the second and third costal cartilages and interspaces, as an expansile pulsating tumour. Palpation may show that erosion of one or more of the cartilages from pressure of the tumour has taken place, and a thrill, systolic or diastolic, or both, may be felt. The swelling is dull to percussion, and the dulness may shade off to a considerable distance in all directions from the seat of maximum pulsation. On auscultation a systolic murmur is usually heard, and often a diastolic murmur also. The existence of the latter, especially if traced downwards to the heart's apex, is almost invariably indicative of aortic regurgitation. When the aneurysm is situated but a short distance from the valve, it is easy to see how naturally the distension of the

vessel will cause a stretching of the aortic orifice and lead to incompetence of the valve. Pain is always complained of, it may be felt in the neighbourhood of the tumour, or radiating over the chest and down the arms, particularly the right, or shooting through to the back. In this form of aneurysm, owing to the direction in which, for the most part, the tumour progresses—namely, forwards—interference with respiration and swallowing, or paralysis of the vocal cords—symptoms so frequently present with the variety next to be described—are conspicuously absent. There may be œdema, however, of the right arm from interference with the venous circulation, and shooting pain from pressure on the brachial plexus is not uncommon.

B. Transverse Portion, Aneurysm of.—When this part of the aorta is the seat of aneurysm, the signs may be less obvious. Sometimes no distinct pulsation can be made out, and there may be no decided impairment of resonance over the upper part of the sternum. On the other hand, there may be well-marked pulsation and dulness, the surface of the chest at the second left cartilage and interspace being a favourite point for their manifestation. A double murmur, or a systolic murmur only, may be present, or there may be none. Even in the last-mentioned case, however, the sounds are not normal. The systolic sound has a booming quality, which it is difficult to describe. It has been called a “thud” or “shock sound.” The second sound has a ringing or metallic quality, and is accentuated, provided that the aortic valves be competent. Pulsation also may be felt in the episternal notch.

Pressure signs are usually well pronounced. Pain is experienced, as in the case of aneurysm of the ascending aorta, and is chiefly due to erosion of the sternum and rib cartilages and to pressure on the intercostal nerves. Dyspnoea, which is often very distressing, results directly from pressure on the trachea or bronchus, and indirectly from involvement of the pneumogastric nerve, causing spasm or paralysis of laryngeal muscles; aphonia from the same cause may also be present. Pressure on the pneumogastric and pulmonary plexus or on a bronchus may set up a form of pneumonia. Cough is always present more or less, and is of a ringing, brassy, or hoarse character. Dysphagia from pressure on the œsophagus is another symptom which may be present. Pressure on the sympathetic causes in the first instance dilatation of the pupil

from irritation, and later, when the pressure is more complete, contraction takes place, from paralysis. Pressure upon venous trunks causes engorgement, cyanosis and œdema, and a clue may be found to the particular part of the aorta affected by the distribution of these signs. Some difference in the radial pulses is often found. This may be a pressure effect, the aneurysm compressing the subclavian artery, or it may occur from partial occlusion of the mouth of the innominate or left subclavian by patches of atheroma or calcification, or from the loss of elasticity of the affected portion of the aorta. The thoracic duct has also been found to suffer from pressure, but this is not common; malnutrition would be its only indication.

C. Descending Portion, Aneurysm of.—The further the aneurysm is situated from the ascending portion of the vessel the more difficult does the diagnosis become. Pain will be present, and may be referred chiefly to the back, owing to erosion of vertebræ and involvement of intercostal nerves. It is often aggravated by movement. There may be obvious pulsation in the space between the scapula and spinal column, and a murmur may be heard in the same region. Most of the other pressure signs enumerated in the last section will probably be wanting, but the bronchus and lung are likely to suffer from pressure. Aneurysms in this situation are often very obscure, and may not even give rise to such symptoms as bring the patient under the notice of a medical man at all. The writer had his attention called to a case where death occurred suddenly in the street from profuse hæmatemesis. Post-mortem, the cause was found to be an aneurysm of the descending aorta, which had ruptured into the œsophagus. It was too small to have produced any decided symptoms during life.

There are certain diseased conditions liable to be mistaken for aneurysm of the thoracic aorta which may be mentioned. They are mainly two—(1) Pulsating empyema, a very rare condition, which, if other means of diagnosis fail, may require an exploratory puncture for its demonstration; and (2) malignant growth overlying the aorta or heart, possibly forming an obvious tumour, and transmitting a pulsation to the chest-wall. In such a case the presence of cachexia and of enlarged glands will assist the differential diagnosis, and also the fact that the pulsation is not distensible, and that the auscultatory signs do not correspond

with those of aneurysm. The results of treatment may also help somewhat. In the case of aneurysm the tumour may decrease in size, the amount of pulsation may diminish, and pain may abate, but no such favourable changes will occur in the case of a growth.

II. *Abdominal Aorta*.—As regards this part of the aorta the same points *mutatis mutandis* have to be considered. The absence of the bony casing which encompasses the thorax renders, in some respects, an aneurysm here more easy of exploration. On the other hand, there is less evidence to be got from pressure signs; often, indeed, none at all except such as expresses itself in pain. The seat of the aneurysm is most commonly the upper part close to or involving the celiac axis. The first, and sometimes the only, symptom is pain in the back, which is aggravated on movement; it may shoot through from the back to any part of the abdomen, or down the loins and thighs. Constipation and dyspeptic symptoms are often present. Tumour and expansile pulsation are found in the course of the vessel, generally in the epigastric region and to the left of the middle line. If the tumour press backwards, abnormal pulsation, and possibly a bruit, may be detected in the loin. A systolic murmur may be heard in front, or there may be none. In a very few cases a diastolic bruit has been reported. Two other diseased conditions, both of which may very closely simulate aneurysm of the abdominal aorta, may be confounded with it. The one is pulsating aorta, mostly, although not exclusively, found in neurotic females. Here the pulsation is not expansile, and there is, properly speaking, no tumour; nor is a bruit heard, as a rule, with moderate pressure of the stethoscope. The other is tumour of some other part, overlying the aorta and receiving pulsation from it. Here also the pulsation is not expansile, and, as the disease is most likely to have its seat in the stomach, there will be special symptoms referable to that organ, such as vomiting. A method of inter-diagnosis usually recommended is to place the patient on his hands and knees, when, if the pulsation be aneurysmal, it will still be felt; if communicated through an overlying growth, it will disappear, owing to the latter falling away from the vessel. It is always well to investigate this point, but the result is not absolutely conclusive. (See ABDOMINAL TUMOURS, DIAGNOSIS OF.)

ETIOLOGY AND PATHOLOGY.—The essential preliminary to the formation

of an aneurysm of the aorta is a weakening of some part of the wall of the vessel. This is most frequently the result of atheroma. Given this localized weakness, any strain, such as lifting a heavy weight, may provide the immediate cause. The history of persons suffering from aortic aneurysm so frequently shows a syphilitic taint that syphilis must be admitted to be a frequent cause of the disease. Gout also has a considerable influence; so has intemperance. As might be expected from the foregoing considerations, the incidence of aortic aneurysm is much more on males than on females, the former being more commonly employed in heavy bodily labour. As regards age, the disease is mainly one of the prime of life, most cases occurring between the ages of forty and fifty. The size of aortic aneurysms varies very much. It depends greatly on the direction in which progressive enlargement takes place, implicating, or not, important structures. And there is, no doubt, an individual element also to be taken into consideration. The sac is generally, if irregular in shape and not of the fusiform kind, found to contain laminated clot, which may be tolerably firmly adherent to the wall of the vessel. It commences as a deposit on the arterial wall, which has been rendered rough by atheroma or calcification, and, in the case of the typically saccular aneurysm, it may go on till the sac is filled up and the aneurysm obliterated, a spontaneous cure taking place. In any case the sac will be seen to be the seat of numerous patches of atheroma. If a fatal result has occurred through rupture of the sac internally, the effused blood will form a tumour external to the aneurysm, or it will be found in one of the cavities of the body, such as the pericardium, pleura, or peritoneum.

PROGNOSIS.—This is ultimately very unfavourable, although life may be prolonged for years after the signs of aortic aneurysm have become well marked; and it must be remembered that the disease may exist long before it is discoverable, for it is only when the dilatation of the vessel reaches a certain size that symptoms or physical signs are produced. Important elements in the prognosis are the age of the patient, and the condition of his arteries, the presence or absence of gout or kidney disease, and the general habits past and present. When the case proceeds to a fatal issue the immediate cause of death is frequently rupture of the sac, its contents

escaping into the pleura, pericardium, right chambers of the heart, large vessels in the neighbourhood of the heart, bronchi, or œsophagus. Comparatively rarely the aneurysm bursts externally. Other immediate causes of death are exhaustion from pain and want of sleep, suffocation from pressure of the aneurysm on the trachea, a low form of pneumonia associated with occlusion of a bronchus, starvation from pressure on the œsophagus, and syncope from consecutive degeneration of the heart muscle. The last is seen in cases where the aortic valve has been incompetent. Some intercurrent disease may also cut short the patient's life.

TREATMENT.—The treatment of aneurysm of the aorta must be considered from two aspects, the medical and the surgical, the object in both being to induce coagulation of the blood in the aneurysmal sac. In the case of medical treatment this is sought to be accomplished by retarding the circulation and reducing the tension in the aneurysm; in the other the same end is attempted to be gained by more direct means. As regards the former, rest in the recumbent position, careful dieting, and iodide of potassium are about the only means on which reliance can be placed. Various drugs have been recommended, but they are mostly of but little use. Among such may be mentioned digitalis, ergot, and acetate of lead. With regard to the first-mentioned drug it is difficult to see how it can be of any service, as its action is to increase the force of the circulation, which is just what it is desirable to avoid. Opium in grain doses, or morphine subcutaneously (gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$), is to be recommended for the relief of pain, and benefit has occasionally been experienced from the application of an ice-bag over the seat of the aneurysm. The first thing in treating a case of aortic aneurysm is to confine the patient strictly to bed in the recumbent position. The diet should be restricted after the plan recommended by the late Mr. Tuffnell. His scale is as follows:—For breakfast—Bread and butter, 2 ounces; cocoa or milk, 2 ounces. Dinner—Boiled or broiled meat, 3 ounces; potatoes or bread, 3 ounces; light claret, 4 ounces. Supper—Bread and butter, 2 ounces; milk or tea, 2 ounces; the solids thus amounting to 10, and the liquids to 8 ounces. Something more, both of solid and liquid food, may be allowed without jeopardizing the beneficial result to be looked for; and, as

against thirst, a little ice may be allowed occasionally. Two or three months (preferably the latter) would constitute a fair trial of this mode of treatment. The presence of aortic regurgitation is a distinct contra-indication for Tuffnell's method, as in such a case the compensatory hypertrophy of the left ventricle, which it is so desirable to maintain, is likely to fail under the combined influence of the low diet and prolonged rest. As to medicines, the iodide of potassium should be prescribed in doses of 10 grains three or four times a day to begin with, and this may be increased by 5 or 10 grains weekly till 60-grain doses are reached. The drug is supposed to increase the coagulability of the blood, to diminish arterial tension, and to strengthen in some way the wall of the sac. The increase in dose should be stopped (according to Dr. G. W. Balfour) whenever the pulse-rate begins to be permanently increased. If the disagreeable effects comprehended under the name "iodism" be produced, it should be omitted for a day or two, and then resumed; and when the limit of dose, which will vary in different cases, is reached, it should be steadily persevered with for many months.

Whatever effects the drug may produce on the wall of the sac there can be no question of its power to relieve the distressing pain so much complained of; and, as to the length of time during which, and quantity in which, it may be taken, the writer may mention that he has had under his care a woman who took it in considerable doses (grs. xx) three times a day, with very little intermission, for five years, and has another under treatment at the present time who has taken upwards of 60 grains every six hours for several weeks. In both cases the intermission of the drug has been followed by an increase in the symptoms, but in neither is there evidence that coagulation has taken place in the sac.

Surgical treatment seeks to procure coagulation in the sac of an aortic aneurysm by three methods—galvano-puncture, distal ligature, and the introduction of some foreign body, such as steel wire, horsehair, or catgut. None of these has been very successful, and all are dangerous. It is not too much to say that the average duration of life has been shortened rather than lengthened by surgical procedure in aortic aneurysms; and yet there are unquestionably cases on which it is right to make the trial of such treat-

ment. But it should only be done after failure of other methods, in carefully selected cases, and with the intelligent consent of the patient. Galvano-puncture and the distal ligature have in a few cases resulted in cure, at least for a term of years; as to the other method mentioned, very little good has come of it hitherto, but it may be said to be still on its trial. Here again the presence of aortic regurgitation is a contra-indication to all such treatment, as clots, if formed, could hardly fail to be dislodged, and carried onwards in the blood-stream until peripheral vessels were blocked. In the case of some aneurysms of the abdominal aorta—those, namely, which are not too high up in the vessel—besides the methods of treatment already enumerated, there is another plan—viz., the application of pressure above the sac, with a view to interrupt for some hours the passage of blood through it and so to cause clotting. Cures have occasionally resulted, but there is great danger of setting up inflammation of the intestines, and possibly gangrene of the bowel, or of one or both extremities.

DAVID W. FINLAY.

APHASIA.—Under this heading will be considered the disorders of speech usually associated with hemiplegia, but which also occur as a temporary symptom after some right-sided convulsions. They may be classified as (1) aphasia, (2) amnesia, (3) mechanical difficulties of articulation.

1. **Aphasia**, called also motor aphasia and ataxic aphasia, denotes the deprivation of the faculty of articulate speech, and is usually associated with an inability to write (agraphia). The aphasic can usually make some incoherent sounds, thereby showing that the vocal apparatus is not affected, and sometimes can say one or two words, as "Yes" and "No," or he uses some expression, such as "Baba," in reply to every question. He usually understands questions spoken to him, and also written questions; he can point out objects named, although he cannot name them; he knows when they are called by the right name, but he cannot repeat the name of an object when told to do so. The word spoken calls up in the patient's mind the idea of the word, but he is unable to repeat it, as the part of the brain which registers the word and executes the repetition of it is damaged. This area of the brain is in the posterior part of the *left* third frontal convolution of the cor-

tex and in the neighbouring part of the island of Reil, and consequently aphasia is nearly always associated with *right* hemiplegia. In the cases recorded, where it was present with left hemiplegia, the patient was left-handed. The condition of the aphasic varies in different cases; some can neither speak nor write; some can write, but cannot speak—*aphemia* (Bastian); some can speak a little, but cannot write—*agraphia*; or perhaps can only perform the very automatic action of writing their names; they can all understand spoken language, and, usually, written questions. Although aphasics cannot speak or can only use a few words, they will sometimes, when annoyed or bothered, swear or say "Oh dear!" or even answer "No" correctly to a question. That these are only automatic reflex utterances is proved by the fact that they are quite unable to repeat the expression voluntarily when told to do so directly afterwards. Aphasics can laugh, and sometimes sing and play at games, such as draughts, &c.

2. **Amnesia**, or sensory aphasia, is a condition which may exist alone or in association with aphasia, as just described. Three forms of amnesia are met with; they may occur either separately or in combination with each other. In one form of amnesia the patient can articulate quite well, and can converse and answer questions, but every now and again he forgets a word, and either comes to a standstill or puts in wrong words, or his language becomes a meaningless jargon; he knows what he wishes to say, but he cannot find the necessary word owing to a defect in the co-ordination of the speech centres. When asked the name of an object, he will say, "I know," but he has forgotten what it is, or he will make an attempt and produce a word something like the one required; but when the word is spoken he can repeat it correctly. In some cases "nouns" have disappeared from the patient's vocabulary (Broadbent). Two other forms of amnesia are met with, called "word-blindness" and "word-deafness," in which the patient can speak and write fluently. In *word-blindness* all written communications reaching the speech centre through the sense of sight are cut off. He cannot read or understand written language; he may recognize and pronounce the names of letters, but he cannot understand the meaning of the words they form. He can express his thoughts in writing and write from dic-

tation, but he cannot read or understand what he has written; he can also copy drawings and writing, but he usually copies the exact type and does not change printed into written characters. With all this he is able to speak and converse fluently, unless the word-blindness is complicated by motor aphasia. In cases which have been examined after death the lesion has been found to be in the angular gyrus of the left side—the convulsion which has been found by Ferrier to be a fundamental portion of the visual centre. The angular gyrus is in communication by connecting fibres with the adjacent third frontal convolution, and in word-blindness either these fibres are injured or a part of the angular gyrus is damaged. In the other form of amnesia, *word-deafness*, the patient has lost the power of executing commands reaching him through the sense of hearing. He is not deaf to ordinary sounds or to music, but he cannot understand spoken words. He can usually read, write and speak well, but in some cases his speech is a mere senseless jargon, owing to the fact that he is unable to call up the auditory impression or to hear the sound of the word he wishes to utter. This is also the case sometimes in reading aloud: he sees the word correctly, but cannot recall the sound of it so as to pronounce it properly; he speaks fluently, but does not know that he is talking nonsense. Though these patients can usually understand simple written commands, they cannot always comprehend long sentences. This may be due to the fact that, in reading, complicated words require not only to be received by the visual centre, but the sound of them has also to be recognized by the auditory word-centre before they can be understood, and, if the auditory word-centre be damaged, the mere visual recognition is not sufficient. These patients can copy sentences correctly, but they cannot write from dictation. The lesion found in cases of word-deafness is situated in the superior temporo-sphenoidal convolution, especially that of the left side, the part assigned by Ferrier to the auditory centre, and either this centre is damaged or the connecting fibres between this gyrus and the third frontal convolution are destroyed.

3. **Mechanical Difficulties in Articulation.**—This form must be carefully distinguished from aphasia and amnesia. Here there is no difficulty in understanding written or oral communications.

The patient is usually able to speak, but the words are “thick” and the pronunciation is imperfect. In some cases, however, the patient is unable to utter a sound, and this is associated with defective movements of the tongue and difficulty in swallowing. In such cases the lesion is situated in the pons Varolii or medulla. Complete loss of all articulation is also produced by a double hemiplegia, which destroys the fibres in the internal capsules coming from the articulatory centres (third frontal convolution) of both sides. If the fibres in the internal capsule coming from the articulatory centre of one side only, especially the right, be involved, the patient is able to speak, as each centre acts bi-laterally, but his speech is often indistinct. The quality of the speech differs according as the soft palate, the tongue, or the lips are affected.

The *prognosis* in aphasia and amnesia varies very much in different cases. Some patients, especially those advanced in age, never improve, and for the rest of their life can utter only one or two meaningless words, while other cases steadily improve, learning fresh words until they almost completely recover.

The *treatment* of aphasia is the same as that of the hemiplegia which so often accompanies it, but, in addition, very much may be done in teaching the patient fresh words and the sounds of letters. Many patients have to learn speech from the beginning, just like a child. In other cases it is useful to get the patient to learn to spell words by using detached letters. In short, every channel by which he can be made to re-learn the functions of speech which have been lost must be made use of. The theory of the recovery from aphasia is that the opposite hemisphere—in most cases the right third frontal convolution—takes on the work of the damaged left side, and in time, by education, is able to perform the functions of its fellow.

C. E. BEEVOR.

APHONIA.—For the production of voice it is necessary that the vocal cords should first be fixed in the proper position, and that they should then be thrown into vibration by air forced through the glottis by an expiratory effort. Aphonia, or loss of voice, may be due, therefore, to (a) interference with the approximation of the vocal cords, (b) alterations in the cords themselves impeding their vibration, and (c) a

deficiency in strength of the expiratory current.

(a) The non-approximation of the cords may be due either to nervous, muscular, or mechanical causes. To the former class belong conditions producing paralysis of the adductor muscles of the cords, the so-called hysterical aphonia is a member of this group. In certain inflammatory affections, the muscles of the larynx become infiltrated, and are consequently unable to adduct the cords properly, or to render them sufficiently tense. Swelling about the arytenoid cartilages, new growths, &c., may set up changes in the crico-arytenoid joint, and thus lead to mechanical interference with the approximation of the cords. (b) The vocal cords may be destroyed by ulceration, be adherent to the sides of the larynx, or be so altered by the presence of a new growth as to be unable to vibrate properly. (c) Feebleness in the expiratory current may be due to advanced disease of the lungs, to loss of power in the respiratory muscles, or to conditions such as obstruction of the trachea by tumours, tracheotomy and perforating wounds of the trachea, which prevent the air current from impinging upon the cords with sufficient force.

F. DE HAVILLAND HALL.

APHTHÆ.—Much confusion has arisen from the use of this term as a synonym for *thrush*; the latter should be restricted to that form of stomatitis dependent on the presence of a vegetable parasite, the *oidium albicans*.

Symptoms.—Aphthæ, or aphthous stomatitis, commences as whitish, opaque, elevated spots on the tongue, buccal mucous membrane, or pharynx. At their commencement they are vesicular, but the vesicles soon rupture and leave small oval or circular ulcers, covered with a yellowish-grey or whitish slough, and surrounded by an inflamed margin. The patient is usually feverish; the mouth is sore and tender, and there is difficulty in sucking or taking food. Salivation is invariably present; the breath is generally foul, and there is frequently intestinal irritation. The disease has a tendency to come in crops, the patient getting nearly well, and then having a relapse.

Diagnosis.—It is distinguished from thrush by the larger size of the patches, and their irregularity, by their inflamed margin, and by the absence of the characteristic parasite found in the

latter disease. It may be confounded with herpes of the pharynx, but in this comparatively rare affection the vesicles are larger and more distinct. In itself, aphthous stomatitis is not a severe or dangerous affection, more especially in childhood, but coming on in old age or in patients exhausted by disease, it is of an unfavourable augury.

The *pathology* of the disease has been sufficiently indicated in the description of the mode of onset. The only point of difference of opinion is as to the condition which precedes the stage of ulceration. Some authorities maintain that this is of a vesicular nature—this is the view taken by the writer; while others maintain that there is a fibrinous exudation.

Etiology.—The disease is chiefly observed in children between the ages of six months and three years. It is generally associated with some febrile affection, such as measles, or occurs as a concomitant of dentition or intestinal derangement.

Treatment.—At the commencement, unless diarrhœa exist, it is well to give a mild aperient, such as a teaspoonful of castor oil or of fluid magnesia; if diarrhœa be present, 2 or 3 grains of carbonate of bismuth, with an equal quantity of the bicarbonate of sodium in cinnamon water, given every four or six hours, will quiet the bowels; a mixture containing 2 minims of liquor potassæ, 2 of ipecacuan wine, 10 of syrup of tolu in 2 teaspoonfuls of dill-water given every four hours, will generally relieve the gastro-intestinal irritation accompanying aphthæ. The specific, however, for the disease is undoubtedly chlorate of potassium, which may be given in 2 to 5 grain doses, either alone in some sweetened water, or in combination with either of the mixtures just mentioned. Locally, the greatest cleanliness is requisite. If the child be old enough, it may be taught to wash out the mouth every two or three hours with a gargle containing 20 grains of borax and 20 minims of glycerine in the ounce of water. In the case of infants it will be necessary to swab out the mouth with the same solution by means of a piece of soft rag securely attached to a holder. Great attention should be paid to the diet, which should be plain and unstimulating; and, in the case of children using the bottle, the greatest care should be given to ensure that both it and the tube are perfectly sweet.

F. DE HAVILLAND HALL.

APNŒA has been used by some writers as synonymous with asphyxia, but it is now only employed in the sense in which it is used by physiologists—viz., to denote the condition in which the blood is too highly arterialized, *i.e.*, contains too large a proportion of oxygen, and consequently fails to stimulate the respiratory centre in the medulla; the result being that respiration is arrested.

APOPLEXY, Cerebral.—A sudden loss of consciousness, due to changes in the brain, usually the result of (1) hæmorrhage, (2) thrombosis, or (3) embolism. Cases in which no lesion can be discovered after death are described as (4) simple apoplexy.

Symptoms.—There is sudden loss of consciousness, and the patient falls to the ground, but there is no failure of the heart's action as in syncope. Before the attack there may have been tingling and numbness in the limbs, with headache and drowsiness. In the attack the patient lies with all the limbs relaxed, the pupils are dilated and react very slightly or not at all to light, the respiration is stertorous, the face is either flushed or pale, and there is retention of urine or it is passed involuntarily. In some cases the patient is able to swallow, but in others the power of swallowing is lost. The superficial reflexes are often abolished. Death may occur in a few minutes, or consciousness may remain in abeyance for hours or days. Later on there are often signs of paralysis on one side, that opposite to the seat of lesion in the brain, the paralysed limbs being flaccid; the pupils are often unequal, and there may be conjugate deviation of the eyes and rotation of the head *away* from the paralysed side, and *towards* the non-paralysed side—*i.e.*, the patient looks towards the side of the lesion in the brain. The mouth is drawn over to the non-paralysed side. These phenomena are due to the unopposed action of the non-paralysed muscles. Should recovery take place, consciousness gradually returns, when the patient is usually found to be hemiplegic—*i.e.*, he has lost power in one-half of the body (*see* HEMIPLEGIA). There is often slight elevation of temperature on the paralysed side. The state of the body temperature has been shown by Bournville to be very important. In cases in which death occurs in a few hours, the temperature falls to 96° or lower, and goes on sinking; when it occurs in ten to twenty-four hours, the initial fall is followed by a

rapid rise till death ensue; if death is to happen in a few days, there is a stationary period after the fall, and from the second to the fourth day a rapid rise occurs. Recovery is probable when there is an initial fall, followed by a slight rise for three or four days, and a return to the normal. In Bournville's observations, the temperature was taken in the rectum.

The degree of unconsciousness, and the severity of the attack, depend upon the position and the extent of the lesion. The loss of consciousness is due to shock produced by the effused blood ploughing up and lacerating the brain substance, or to anæmia, owing to the blocking of the vessels supplying a part of the brain. It is greater when it is caused, as in the former case, by hæmorrhage, than in the latter, when it is due to thrombosis or extensive embolism.

1. **Hæmorrhage** may occur either into the meninges or the substance of the brain, pons, or medulla; in the latter case it is often due to rupture of an aneurysm, about the size of a small pea, of the middle cerebral artery, especially the left; or of the basilar or other artery of the brain: or to rupture of miliary aneurysms the size of $\frac{1}{25}$ th of an inch or less, which are sometimes found in large numbers on the arteries about the optic thalamus and in other places. Syphilis, alcoholism and Bright's disease are the most frequent predisposing causes; in the latter disease the arteries are degenerated, and the increased blood pressure brings about rupture. Softened patches in atheromatous vessels may give way, and so cause hæmorrhage.

2. **Thrombosis** results from narrowing of the arteries; the change may be either local or general. Nodules are produced between the inner coat and the elastic laminæ; these project into, and narrow the lumen of, the vessel, or produce a rough surface on its interior, conditions which favour the formation of thrombi. A special form of disease of the cerebral vessels is caused by syphilis. Atheroma, either localized or diffuse, is frequently present in the subjects of chronic Bright's disease. Wasting diseases also, such as phthisis and carcinoma, by slowing the blood-current, predispose to thrombosis. The arteries most affected are the middle cerebral, basilar, and carotid.

Thrombosis of the superior longitudinal sinus sometimes occurs in anæmic girls, and clotting in the lateral sinus is frequently found in association with caries

of the petrous bone. Meningitis and erysipelas of the face and scalp may also present this complication.

3. **Embolism.**—Although embolism of the cerebral vessels frequently occurs without causing loss of consciousness, still if the emboli be numerous or the vessel occluded a large one, the ensuing anæmia of the part supplied will be severe enough to cause unconsciousness. Anæmia and, subsequently, softening of the part supplied by the blocked vessel ensue, owing to the absence of any collateral circulation above the circle of Willis. The left middle cerebral and internal carotid are the arteries most often affected, owing to the fact that the orifice of the left common carotid lies more directly in the course of the blood-current than does that of the innominate.

4. **Simple apoplexy** is the term applied to cases of death from coma, when no lesion is found in the brain. It is probable that many of these are cases of epileptic coma (Gowers).

Ingravescent apoplexy is a name given to loss of consciousness with slow onset. In such cases there is usually a gradual leakage of blood from the ruptured vessel.

The *diagnosis* of apoplexy from other forms of unconsciousness is considered under DISORDERS OF CONSCIOUSNESS. Of the different forms of apoplexy, it may be said that in hæmorrhage the unconscious state is always longer and more profound than in that due to thrombosis or extensive embolism. Hæmorrhage and thrombosis usually occur in old people, and embolism in younger persons. Prodromata such as headache, tingling, numbness, and drowsiness are present in the two former and not in the last.

The *prognosis* of apoplexy depends on the cause, being much more serious in hæmorrhage. Death may ensue while the patient is unconscious. Profound coma with complete relaxation of the limbs, involuntary micturition and abolition of all the superficial reflexes, are very serious symptoms, and probably indicate the presence of extensive hæmorrhage into the ventricles, the meninges, pons or medulla. Any increase in the symptoms is usually due to a further hæmorrhage, and is of bad omen, whilst a speedy return of consciousness indicates a favourable issue of the attack. The state of the temperature is a valuable guide in prognosis.

Treatment.—In apoplexy absolute rest

is essential; the head should be raised a little, and the clothing round the neck loosened. Warmth may be applied to the extremities, and sinapisms to the calves of the legs are considered to have some effect in lessening the amount of blood in the brain. If there be signs of cyanosis and laboured stertorous breathing, with a tense incompressible pulse, venesection is recommended by some writers, but is rarely of much service, and is a mode of treatment now seldom adopted. The bowels should be opened by a drop of croton oil placed upon the tongue. In hæmorrhage stimulants are, as a rule, to be avoided, but if the pulse become very feeble they may be required, but should be administered with extreme caution. When the diagnosis of thrombosis or embolism can be made, ether and ammonia or alcohol should be given if the pulse show any signs of failure, and when this is associated with cold extremities and tendency to collapse purgatives are contra-indicated. The catheter should be passed if there be retention of urine. If the patient be unable to swallow, and the state of unconsciousness be much prolonged, nutrient enemata may be required.

C. E. BEEVOR.

ARCUS SENILIS is the greyish white opaque ring so often seen near the margin of the cornea. As a rule, it commences at the upper part of the cornea and then attacks the lower, two crescent-shaped bands resulting, which gradually coalesce to form a complete ring. There is always a narrow rim of healthy cornea left outside it. The colour at first is greyish white, and gradually becomes more opaque as age advances. An arcus is not often seen before the age of forty, and is very rarely absent in old age. When met with in comparatively young people, it is by some regarded as an indication of a tendency to fatty degeneration of other parts of the body, especially of the heart and arteries. But the connection between arcus senilis and fatty heart is extremely dubious. The appearance is due to a fatty degeneration of the cornea, and is almost invariably symmetrical, though occasionally more marked in an eye which is the subject of long-standing disease. It is not a condition calling for treatment.

ARSENIC, Poisoning by.—Metallic arsenic is not poisonous, but arsenious acid or white arsenic is highly so. It is a white crystalline or powdery substance

very insoluble in water, and is therefore usually administered in the solid form in cocoa, arrowroot, gruel, &c.; the addition of an alkali or an alkaline carbonate increases its solubility.

Acute Poisoning.—The *symptoms* generally appear after an interval, which may be half an hour or an hour, and consist of a burning pain in the mouth extending to the stomach, nausea, vomiting, great thirst, and hoarseness; the abdomen is tender and may be swollen; the vomited matters may be white or black, if the powder had been mixed with soot; or blue, yellow, or green, if mixed with indigo. Diarrhœa and tenesmus are usually present, with burning pain in the intestines and excoriation of the anus. Difficulty of breathing and frequent painful micturition are sometimes complained of. Death may occur within twenty-four hours, or the symptoms may be less severe and there may be remissions. In this variety nervous symptoms, such as cramps, tremors, or even general convulsions, are sometimes met with. In other cases, the irritant symptoms are almost wholly in abeyance, faintness being the chief or only symptom. In cases that do not prove fatal, local paralysis in one or more of the limbs may persist after recovery from the gastric and abdominal affection. The above constitute the symptoms when the poison has been given in one large dose, but it is frequently administered in small and repeated doses. The chief symptoms then will be severe, and continued ill-health for which no cause can be assigned, a liability to vomiting, especially after each meal, or after a particular meal each day, and marked emaciation. Numbness, tingling in the limbs, conjunctivitis, intolerance of light, eczema, and falling off of the hair, are amongst the minor symptoms in such cases; the patients are irritable and depressed, and sometimes suffer from a general paralysis, closely resembling that due to alcohol; when a complete change of the surroundings is effected, the symptoms disappear.

Post-mortem Appearances.—The mucous membrane of the stomach is almost always deeply congested and ecchymosed, rarely ulcerated; it may be smeared with a thick white or yellow paste, the colour being due to the formation of a sulphide of arsenic. The duodenum, and sometimes the whole alimentary track, is usually inflamed; the rectum seldom escapes. The mucous membrane of the mouth and œsophagus will be found in-

flamed and whitened. Should the patient have survived some days, fatty changes will be found in the liver and kidneys, and the spleen will be enlarged and soft. The blood is fluid. Arsenic prevents decomposition, and, in bodies that have been buried for some time, it will often be quite possible to make out most of the above signs in cases of arsenical poisoning.

Treatment.—The stomach-pump can only be used when the patient is seen within a very short time of swallowing the poison; vomiting should be encouraged, and milk and albuminous drinks, such as white of egg, barley water, linseed tea, may be administered by the mouth. When the poison has been given in solution, and the patient is seen early, some freshly prepared ferric hydrate may be given as an antidote. This is made by precipitating tincture of perchloride of iron by carbonate of sodium and filtering. It should be given in hot water and in large quantities, or dialysed iron in doses of one ounce may be given repeatedly. By these means an insoluble ferric arseniate is formed. Diluents should be given freely, and if there be much prostration stimulants will be required.

Chronic Poisoning.—There are other preparations of arsenic which may be dangerous; of these, the most important is the aceto-arsenite of copper or emerald green, which at one time was largely used in the manufacture of wall-papers and artificial flowers. An arsenical wall-paper is usually, but not necessarily, green. The danger from such a paper is diminished by varnishing and glazing. Those who suffer most are the paper-makers, the paperhangers, and the people who inhabit the rooms so papered. The symptoms are those of general indisposition, coming on very gradually, but steadily progressing; headache, nausea, and languor being succeeded by coryza, cramps, pain and tenderness in the abdomen, and a marked degree of cachexia. Paperhangers are liable to eczema about the root of the nostrils, the backs of the ears, bends of the elbows, insides of the thighs and scrotum. Removal of the exciting cause is sufficient to effect a speedy cure.

ARTERIES, DISEASES OF.—

Most of the diseases affecting arteries may be comprehended in two classes, according as they depend upon inflammation or degeneration.

I. Inflammatory Diseases of Arteries.—**ACUTE ARTERITIS** occurs only

locally. It is due to several causes, such as the presence of an embolus; or, in the case of the aorta, to the friction of a ruptured valve or a long tag-like vegetation. In such cases ulceration may ensue, although perforation of a vessel is exceedingly rare. But there is another class of cases in which the destructive influence comes from the outside (*e.g.*, cancerous ulceration), and perforation from this cause occurs with tolerable frequency.

ACUTE ENDARTERITIS is seldom seen except in very large arteries, being most frequent in the aorta. The internal coat of the vessel is found to be swollen, and elevated into small semi-transparent gelatinous patches of circular or irregular shape which are soft and elastic, but rarely show ulceration. They consist mainly of embryonic cell growth. All the coats are ultimately affected.

PERIARTERITIS.—The inflammatory change just mentioned, which is at first limited to the internal, may by extension outwards affect the external coat of the artery, the middle coat either escaping altogether or showing comparatively but little evidence of disease. The tissue of the external coat is thickened, and the fasciculi of connective tissue are separated by groups of embryonic cells. In the case of small arteries, however, periarteritis is the result, not of change within, but from outside the vessel.

CHRONIC ENDARTERITIS (also named *Atheroma*, and *Arteritis Deformans*) is very commonly met with. It is especially a change of advancing age, and is partly degenerative. It is typically seen in the aorta, although frequent also in some of the smaller arteries (*e.g.*, those of the brain). It may be preceded by fatty degeneration, with which, indeed, it is sometimes confounded. Its immediate cause is mechanical irritation due to the force of the circulation.

Etiology.—It is still a moot point how far syphilis may be concerned in the production of this form of disease. Age, as already stated, is an important factor in its causation, and the male sex is more obnoxious to it than the female, owing mainly to the fact that the bulk of hard manual labour falls on the former.

Morbid Anatomy.—Taking the arch of the aorta as the type, the internal coat of the vessel is seen to be thickened in patches which are of a dull yellowish white colour, hard and opaque, causing considerable irregularities and encroaching on its lumen. The vessel itself is rendered rigid and inelastic. Microscopically, the thickened internal coat

consists of dense connective tissue infiltrated with numerous round cells. In the more advanced patches fatty degeneration is also found, which is brought about by disintegration, first of the cells and then of the intercellular material. As a result, cavities may be formed containing molecular debris and cholesteroline: this constitutes the so-called “*atheromatous abscess*.” If the endothelium covering one of these patches be destroyed and the abscess exposed, an “*atheromatous ulcer*” is formed. It should be mentioned, however, that these names are used only for convenience, both being, pathologically speaking, incorrect.

The results of chronic endarteritis may be very serious. *Atheromatous* patches become calcified, and, acting as foreign bodies, fibrinous deposits form upon them; these may gradually increase until the channel of the vessel is completely obliterated (*see THROMBOSIS*), or they may be washed off by the blood-stream and carried to smaller vessels, which they block (*see EMBOLISM*), the consequence in either case being that the blood supply beyond the point of blocking is cut off unless the circulation can be carried on by collateral channels, and death of the part may take place. Fatty degeneration is another result affecting in a very marked way the cerebral arteries, being here a fruitful cause of cerebral hæmorrhage. The occurrence of aneurysm also is favoured by the weakening of the wall of the vessel and the loss of its elasticity (*see ANEURYSM*).

Diagnosis.—Except in the case of arteries which may be felt, the diagnosis can only be a matter of inference. If arteries which are accessible to the finger be rigid and tortuous, we may with reason suspect that the same condition is present in those which are beyond our reach, especially when the investigation is called for by conditions which are led up to by arterial disease (*e.g.*, cerebral embolism or thrombosis, or gangrene of a limb).

Treatment.—This can only be prophylactic and palliative, and must consist in moderation in everything, especially in food and drink, and in abstinence from over-exertion of any kind, so that the circulation may be kept as quiet and regular as possible.

Prognosis.—The disease being progressive, the ultimate prognosis is grave, but evil results may be postponed for years by care and judicious management. Any symptom indicating implication of the cerebral arteries makes the outlook so much the worse.

ENDARTERITIS OBLITERANS.—Inflammation of the interior of an artery may progress to such an extent as to bring about a complete closure of its lumen. To this the name endarteritis obliterans, or obliterative arteritis, has been given. It occurs in the smaller arteries, notably those of the brain, and is usually due to syphilis. The inner coat of the vessel is the primary seat of the disease, although the outer coat is also sometimes affected and becomes marked by nodular thickenings. The thickenings tend to become vascularized, and do not break down as in atheroma. The effect of this condition is to cut off the blood-supply, leading, in the case of the brain, to softening and paralysis. As regards treatment, much may be accomplished by the use of the ordinary anti-syphilitic remedies, particularly mercury.

ARTERIO-CAPILLARY FIBROSIS.—This is the name given by Gull and Sutton to the change found in the small vessels in the subjects of granular contracted kidney. The outer and inner coats of the vessels are, according to these observers, thickened by a hyaline-fibroid formation, and this not only in the renal vessels, but generally throughout the body. The result is diminution in the calibre of the vessels, obstruction to the circulation, and consequent hypertrophy of the left ventricle (*see* BRIGHT'S DISEASE).

II. Degenerative Diseases of Arteries.—**FATTY DEGENERATION**, apart from atheroma, is sometimes found to affect the internal coat. It is seen typically in the aorta, and may be found in quite young subjects, presenting the appearance of yellowish, opaque streaks and spots scarcely elevated above the surface. On microscopic examination of a patch, it is seen to consist of the cells of the internal coat in a state of fatty change.

CALCIFICATION is one of the results of atheroma. It also occurs as a primary change, in which case it is the middle coat of the vessels which is most frequently affected. Although it is found occasionally in the aorta and other large vessels, it selects preferentially those of smaller size. The muscular fibre cells become infiltrated with lime salts, and the result appears in hardness and rigidity of the arterial walls. This change is frequently present in cases of senile gangrene.

ALBUMINOID DEGENERATION is found in the small vessels of those organs which are affected by that disease, notably the

liver, spleen, kidneys, lymphatic glands, and intestine. It is a common result of long-continued suppuration and of syphilis.

Raynaud's Disease (*q.v.*) may be mentioned, in conclusion, as another variety of disease of arteries which does not come under either of the classes already described.

DAVID W. FINLAY.

ASCITES (Dropsy of the Peritoneum).—Ascites may be part of a general dropsy, the result of disease of the heart or kidneys, or it may be of local origin. In cardiac disease it depends upon the failure of the pumping action of the heart, by which the peritoneum—a large lymph space—is kept dry; in renal disease it results from more complex and obscure causes, in which the following factors co-operate:—(1) Accumulation of water in the blood from failure of the kidneys to secrete sufficient urine; (2) increased outflow of watery lymph from the capillaries, partly from the altered state of the blood, partly owing to increased permeability of the vessels, the consequence of an alteration in their walls. Cohnheim and Lichtheim, in their experiments on the production of dropsy by artificially rendering the blood more watery, found that dropsy of the peritoneum invariably followed.

Ascites of local origin results from (*a*) an obstruction to the portal circulation, or (*b*) some affection of the peritoneum itself—*e.g.*, chronic inflammation, tubercle, or malignant disease. Obstruction to the portal circulation is the most common cause, and is generally due to atrophic cirrhosis of the liver (*q.v.*). In some cases of cirrhosis, owing to the development of a collateral venous circulation, no dropsy ensues, but this is exceptional.

In rare instances ascites is caused by blocking of the portal vein from thrombosis or from the presence of an enlarged gland in the hilum of the liver.

Chronic inflammation, tubercle, and cancer cause effusion of fluid by blocking the lymph paths by which it is normally removed from the cavity, whilst at the same time there is an increased outflow from the capillaries.

In simple dropsy the fluid in the peritoneal cavity is clear yellow serum, which coagulates on standing. It usually contains more water and less albumen than the fluid in the pleura and pericardium, but less of the former and more of the latter than that in the subcutaneous

tissues. In renal dropsy it often contains urea. In inflammation, tubercle, and malignant disease the fluid is turbid, highly albuminous, sometimes quite viscid, and contains shreds of lymph, fragments of new growth, and may be tinged with blood. In simple dropsy the peritoneum is opaque-looking from œdema of its endothelium. In chronic inflammation it is swollen, softened, and covered with lymph, and in tubercle and malignant disease it is studded with these growths. Chronic inflammation may originate from changes in some abdominal or pelvic organ, inflammation of the uterine appendages being a common cause. In cases of ascites of long standing, the result of portal obstruction, the peritoneum, including its reflexion over the liver, is often found covered with a thin, white membrane, which can be peeled off from its surface, and, which when held to the light, is seen to possess a finely fibrous texture. The portion removed from the surface of the liver—*e.g.*, in a case of atrophic cirrhosis—may be fenestrated, the apertures corresponding to the nodules. By some this condition is regarded as primarily a peri-hepatitis, but more probably it is the result of a slight chronic peritonitis caused by the presence of the fluid, as a precisely similar condition of the pleura is seen in long-standing hydrothorax. Tubercle may be primary, or secondary to tubercle elsewhere; it is especially frequent in connection with tubercular ulceration of the intestine. Malignant disease of the peritoneum is most often secondary to cancer of the stomach, intestine, liver, or ovary, or to sarcoma of the pleura. Cancer of the peritoneum when primary is usually of the colloid variety.

Signs.—If the quantity of fluid be considerable, the abdomen becomes uniformly swollen. When the patient lies on his back, the fluid gravitates to the flanks, so that there is a convex curve from the costal border to the iliac crest, and on percussion the note in the flanks is dull, whilst in the umbilical region it is clear. On turning the patient on to his side, these phenomena are reversed, a clear note being elicited in the flank which is uppermost, whilst the area of dulness on the lower side rises into the umbilical region. When the walls of the abdomen are tense, a *percussion wave*, usually termed “*fluctuation*” (*q.v.*), may be felt by laying one hand lightly on one flank, the patient lying on his back, and tapping

with the fingers of the hand on the opposite side.

Treatment.—This must depend upon the nature of the case, and forms part of the treatment of special diseases which are discussed elsewhere. Fluid in the peritoneum is best removed by *paracentesis* (*q.v.*), and the repeated performance of that operation may sometimes lead to a cure of the condition, even though the original cause, *e.g.*, cirrhosis of the liver, remain.

If the amount of effusion be insufficient to justify operation, its removal may sometimes be effected by the administration of purgatives and diuretics. The use of bitartrate of potash electuary is sometimes very successful—*R Potassii bitartratis* ʒss, *mellis* ʒj; sig. a teaspoonful to be taken every two hours till the bowels are freely moved. Or it may be combined with jalap—*R Potassii bitartratis* ʒss, *pulveris jalapæ* grs. x, *mellis* ʒj; sig. a teaspoonful to be taken every two hours till the bowels are freely moved. This treatment can be persevered with daily, but is apt in some cases to cause gastric derangement.

The use of hydragogue cathartics, such as elaterium (gr. $\frac{1}{4}$), gamboge (gr. j), colocynth (gr. j), is not free from danger.

Diuretics are of little use when the ascites is excessive. The venous pressure seems to be too great to allow them to act. In cases of moderate effusion, however, the resin of copaiba in doses of 10 to 15 grains is often of service.

Several cases of tubercular peritonitis with effusion have recently been successfully treated by laparotomy and washing out the peritoneal cavity. A trial of this method should therefore be made in suitable cases.

ROBERT SAUNDBY.

ASPHYXIA includes all conditions which interfere with the function of respiration and prevent the due oxygenation of the blood, death, when it occurs, resulting from poisoning by carbonic acid. Asphyxia is the cause of death in most cases of drowning, in strangulation, suffocation, laryngeal obstruction (whether from foreign bodies, new growths, past ulceration, false membrane, œdema, or spasm), acute capillary bronchitis, paralysis of the chest walls or diaphragm (whether from acute or chronic myelitis, or as a sequel of diphtheria), and in mechanical compression of the chest, and also in certain cerebral states, *e.g.*, epilepsy. Death is sudden when the obstruction to

respiration is at once complete; when incomplete, it is gradual in its onset. The chief feature in all cases of asphyxia is the lividity, which before death always becomes extreme, being most marked in the lips and tongue, which may become almost black. The eye-balls are prominent, the superficial veins stand out prominently, and the breathing becomes more and more embarrassed and shallow. Convulsive twitchings about the mouth and of the limbs are often noticed. The pulse becomes feeble and frequent, but the heart goes on beating after all signs of respiration have ceased.

The *post-mortem appearances* are: Intense venous congestion throughout the body, the right side of the heart and venous system being engorged with black fluid blood, the left side of the heart and arteries being frequently empty. The lining membrane of the air passages will be found intensely congested, and the dependent parts of the body will show post-mortem staining.

The *treatment* would consist of tracheotomy when the obstruction was in the larynx or above it, and artificial respiration, an account of which will be found under the head of DROWNING.

ASTEATOSIS CUTIS is a condition of diminished sebaceous secretion as the result of which the skin becomes dry, scaly, and often fissured. It accompanies prurigo, lichen ruber, and other diseases, in which the sweat secretion is usually proportionally diminished, and occasionally occurs as an independent disease, resulting from frequent washing in hard water, or from the use of certain chemicals (laundresses, photographers). The inunction of lanolin or vaselin gives relief.

ASTHENIA is a synonym for debility, a want of strength. It is a relic of an antiquated pathology, which classified all acute diseases into sthenic, or those which required antiphlogistic remedies, and asthenic, or those which did not call for such active treatment.

ASTHMA.—Asthma may be considered as a disease, and as a symptom of many different diseased conditions. An asthmatic paroxysm consists of a more or less sudden difficulty of breathing, accompanied by a wheezing noise. The affection may be a pure neurosis, a symptom of bronchitis, of some cardiac or renal affection, or due to direct

mechanical irritation of the vagus or its branches. The onset may be sudden. Salter states that he has seen a severe attack developed in thirty seconds, but more often there are some premonitory symptoms, not constant for every case, but known by experience to the patient. These are chiefly, unusual buoyancy of spirits and mental excitement, or depression and a feeling of chilliness, a sensation of irritation in the air passages, vague pains, an itching under the chin, headache, an irresistible sleepiness, flatulent distension of the stomach, and a tendency to pass large quantities of very light-coloured urine of low specific gravity. If the attack take place during sleep, the latter becomes disturbed, and the patient wakes with a fit strong upon him. The afternoon, after an early dinner, is a favourite time for an attack. A slight sense of constriction of the chest, a short dry cough, and a slight wheezing accompanying inspiration are the earliest symptoms; the chest girth is increased, necessitating the loosening of the clothes, and an alteration takes place in the carriage of the body, the shoulders being raised higher than usual.

When an attack is fully developed, the sense of suffocation is terrible. The patient sits up in bed with the elbows fixed and the shoulders raised; sometimes he leans forward with the hands supporting the head, or with the head thrown back resting on the pile of pillows he is obliged to have at his back; or he stands, perhaps near an open window with little clothing on but regardless of cold, the elbows resting on some high piece of furniture. Generally the paroxysms are too severe to permit of the slightest exertion; the perspiration pours off the face from the violence of the respiratory efforts, and at the same time the extremities are icy cold. The countenance is anxious and haggard, and generally pale; there is turgescence of the cervical veins, and sometimes pulsation in the jugulars. Speech is almost impossible. There is no rise of temperature during the attack. The pulse is generally small and quick, but is sometimes intermittent, the intermissions taking place at each effort to inspire. The diaphragm is lowered to its maximum, and there is epigastric pulsation. The chest assumes a barrel shape, and is fixed in the position of deep inspiration. The lungs are full of air, but the air cannot be renewed; the chest feels as if bound with iron, and that relief would follow if it could only be cut open. The efforts of

the patient to introduce air exaggerate the condition still more; all the auxiliary muscles which are strangers to ordinary respiration are called into action, but little movement of the chest results. The respirations do not exceed the normal, but expiration is slow and prolonged. During the height of an attack, the wheezing may be either expiratory or inspiratory. The sound is produced in the larynx, the glottic orifice being spasmodically constricted at an early stage of the seizure.

At some places the respiratory sounds are absent; at others a weak vesicular murmur is heard; but these characters change, sounds becoming audible where previously they were absent, and *vice versa*. This paucity of intra-thoracic sounds is to be accounted for by the diminished amount of the tidal air. The wheezing sounds produced in the larynx and glottis are heard over every part of the chest, and vary with the amount of mucus in the larynx or tubes. The quantity of secretion is very small, and does not much affect the sounds. At the acme of the attack, the walls of the air vesicles are so tense that nearly all the blood is squeezed out of the vessels, but as the distension diminishes, more blood finds its way into the capillaries; secretion takes place, râles of a moist character are developed, and expectoration is sooner or later established. This consists of tough, semi-transparent pellets of mucus of a pale-grey colour, resembling boiled tapioca. This character of the expectoration is peculiar to asthma.

To percussion the chest is hyper-resonant throughout, owing to temporary emphysema, which is present in all cases. The supra-clavicular regions are drawn in, the skin appearing quite tense over the extraordinary muscles of respiration, which stand out like thick cords, and the inter-costal spaces are also made more apparent. The diaphragm is in a state of tonic spasm, its lowered position in some cases causing enlargement of the abdomen; but retraction is the rule. As exhaustion comes on, the severity of the attack begins to abate, respiration becomes more free, and cyanosis decreases. The mucous pellets above described continue to be coughed up for a day or two after the attack, of which they are the result and not the cause.

The *duration of the attack* is often only from two to six hours, followed by sleep, the patient waking up in perfect health, or suffering for a day or two from wheezing and dyspnoea on the slightest

exertion. But sometimes the attacks have a cumulative character, and continue for four or five nights. The duration of the intervals varies, but there is perfect organic integrity of the respiratory and cardiac functions so long as the asthma remains uncomplicated—a proof of the nervous character of the disorder. The attacks are often most severe in the young, and become less marked as the patient grows older. Unless asthma be banished, habitual catarrh and emphysema are established and the respiration is no longer free between the attacks. There is permanent emphysema in inveterate cases, and the ordinary complications and consequences follow—viz., chronic bronchitis, dilated right heart, tricuspid incompetency, and dropsy. As these organic changes take place, the peculiar characters of the asthmatic seizure may be gradually effaced. Spasmodic asthma sometimes subsides if the patient develop bronchitis, but, as a rule, the attacks accompany severe chronic bronchitis.

Of the *pathological anatomy* of asthma there is very little to be said, the disease being of a purely nervous character. In uncomplicated cases nothing abnormal is found after death. In some very rare cases the vagus or phrenic nerve has been found altered by the pressure of tumours. Autopsies on long-standing cases disclose the consequences of asthma—viz., emphysema, bronchial catarrh, bronchiectasis, and lesions of the heart and aorta. Death during a fit of pure asthma is almost unknown; the act of dying, so to speak, relieves the spasm, and the attack subsides. Asthma is rarely recovered from, but the progress is always slow, and without any marked influence upon the duration of life.

Pathology.—As far back as 1720 Floyer entertained the theory that asthma was due to a contracted condition of the bronchia. This theory, that asthma results from a spasmodic contraction of the muscular coat of the smaller bronchial tubes, has been supported by many writers of eminence, whilst others consider that a spasmodic contraction of the diaphragm is the chief cause. A third theory is that the attacks are due to a congested condition of the bronchial mucous membrane analogous to urticaria of the skin, and a fourth that they result from a contraction of the blood-vessels of the lungs analogous to what takes place in the cerebral vessels previous to an epileptic fit. Again, another theory, to which the writer is disposed to give his support, is

that asthma is due to a reflex spasm of all the inspiratory muscles arrested in the act of deepest inspiration, with overdistension of the bronchial tubes and air cells.

Etiology.—All writers agree that asthma is a nervous disease, and that the nervous irritation may be central or peripheral. In those subject to asthma there exists an abnormal excitability of the pneumogastric nerves. When this is increased, a very slight cause is sufficient to bring on an attack; at other times it requires some definite and usually easily recognized cause to produce an attack. This sensitive condition of the pneumogastric nerves is above all things dependent upon locality and digestion. In many cases the disposition is hereditary, and often occurs in gouty families. The disease is commoner in the male than in the female. The effects of locality have been supposed to be due to moisture, the production of ozone, or to atmospheric electricity. It is a fact that many true asthmatic patients are better in a fog, and, above all, in a London fog, which generally causes urgent dyspnoea in those who suffer primarily from bronchitis and emphysema. And it is known that fogs are associated with a strong electro-positive condition of the atmosphere. Certain winds, especially an east wind, act as an exciting cause in some patients. There are many instances of attacks being brought on by electricity.

Indigestion is a fruitful exciting cause; some articles of diet in particular are more obnoxious than others, such as wine, beer, pastry, sweets, and honey. It is a very dangerous thing for asthmatics to go to sleep after a meal before digestion is accomplished; and cold feet independently of anything else, are said to bring on attacks. Patients suffering from cardiac disease often have well-marked attacks of asthma.

Many vegetable emanations, as from hay, privet, and ipecacuanha, produce attacks in persons predisposed to them; also the smell of certain animals, as dogs, cats, rabbits, guinea-pigs, goats, a sweating horse, or a menagerie. Dust of all sorts may also become an exciting cause, and the dust from blankets is particularly objectionable. Immoderate fits of laughter have often been known to produce a paroxysm. Certain conditions of the mind have also a great effect both in producing attacks of asthma and in causing their sudden relief, such as anxiety, grief, or sudden joy. Often, if the mind can be influenced by some cir-

cumstance calculated to produce pleasure and entirely divert the attention, an attack of asthma will pass off. Severe mental strain, as well as absence of employment calculated to interest and excite the mind, are fruitful causes of the continuance and return of many nervous diseases, and among them spasmodic asthma.

Treatment.—The effects of remedies in asthma are very capricious. During a paroxysm emetics are often very serviceable. Relief is experienced when the first sense of nausea and faintness is induced and before the stomach is emptied. Lobelia also relieves attacks directly its depressing effect is produced. Sedatives and antispasmodics are the most serviceable drugs, and many of them have been used with beneficial results; above all in value is the hypodermic injection of morphia. The objection to it is that, if often used, the dose must be increased; but it is better to increase the dose of morphia than to allow the patient to suffer the agonies of asthma. One-sixth of a grain is at first usually sufficient to subdue the symptoms. Tobacco often gives relief when an attack is threatening, but this drug, in common with others that are directed to be used by smoking, is only available when the attack is not very acute, for, when severe, patients have not breath enough to enable them to smoke. *Datura stramonium* and *datura tatula* are both efficacious drugs in some cases, but stramonium sometimes produces intolerable headache. Many proprietary powders, when burnt near the patient and the fumes inhaled, give great relief. The chief of these are Himrod's Powder, Popham's Specific for Asthma, Senier's Asthma Remedy, and Girdwood's Asthma Remedy. Nearly all of them contain some plant of the order Solanaceæ and nitrate of potash. A powder of the following composition is often of great service:—*Pulv. stramonii* ʒj, *pulv. seminum anisi* ʒss, *potassii nitratis* ʒss, *tabaci contriti* grs. xxx, a teaspoonful to be burnt and the smoke inhaled. Nitre-paper alone is a most valuable remedy and useful in the great majority of cases. It is made by saturating blotting-paper in a solution of nitrate of potash (grs. xxx ad ʒj). Chlorate of potash is added to some papers, but the addition is not an advantage, as the paper then burns too quickly and the fumes become suffocating. Some asthmatic patients dare not go to bed without first filling their chamber with nitre fumes; they then sleep in safety. Nitrite of amyl

gives temporary relief, but the effect often only lasts for about ten minutes; the dyspnoea then gradually returns. Iodide of ethyl is also reported to have been useful in some cases; in others it aggravated the attack. Chloroform never fails to subdue a paroxysm, but its effects are as evanescent as the drug. Ether, in the form of Hoffman's Anodyne, often gives partial relief, and chlorodyne is often found useful. Hydrate of chloral has been tried, but with contradictory results. Stimulants are sometimes of value, but usually asthmatics do not bear alcohol well in any form. Coffee is a very old remedy, but, if not taken on an empty stomach, it may impede digestion, and do harm rather than good. Citrate of caffeine has recently been found efficacious in doses of from 1 to 5 grains. The condensed air-bath has been known to relieve an asthmatic attack in patients suffering also from chronic bronchitis and emphysema, but in cases of pure spasmodic asthma it has produced a most dreadful sense of suffocation. A rarefied air is sometimes beneficial, but old asthmatics should avoid high altitudes. Electricity is occasionally successful, but sometimes produces attacks in those predisposed to them if used when the patient is in health and breathing freely. It has not yet been decided what form of electricity gives the best results. Iodide of potassium is one of the most valuable drugs in the treatment of asthma; it should be given in considerable doses—grs. x, or more.

Between the paroxysms the general health should be improved, and the tendency to spasm may be diminished by the prolonged administration of small doses of liq. strychninæ, nux vomica, and arsenic. Belladonna, cannabis indica, bromide and iodide of potassium have also been tried, but with varying results. Of course, if the asthma be complicated by bronchitis, treatment must be directed to the relief of that condition. When warning phenomena are experienced, an attack may often be avoided by calming the excitability of the vagus by fumigation with nitre-paper, or by smoking tobacco or stramonium. If the patient be robust and suffer from abdominal plethora, a brisk purgative will often suffice, followed by light diet and repose for two or three days. At the commencement of an attack, the patient should be raised, or placed in an arm-chair; if in bed, he should be supported comfortably by pillows, the room warmed, the clothes loosened, and all

his wants anticipated. Cutaneous irritation, such as rubbing, the application of a mustard and linseed-meal poultice to the chest, or simply brushing the hair for a considerable time, is often soothing.

For the avoidance of attacks the most potent influences are locality and diet. As regards locality, each patient must seek out for himself a place that suits him, and the sites vary within very narrow limits; but, when once a suitable locality has been discovered, the effect is permanent so long as the patient remains there. There is nothing haphazard or irregular about this influence of locality; a patient knows that in a certain place he will be well, and that in another place he will have an attack; and if repeated twenty times it is always with the same result. This effect of locality is immediate, and peculiar for each individual sufferer. Careful dieting is necessary for all patients, and especially for those with a gouty diathesis. Dietetic treatment involves the avoidance of all indigestible food, of heavy meals, and late suppers, and particularly of those things which experience has proved to be provocative of attacks.

W. E. STEAVENSON.

ASTRINGENTS are substances which produce contraction of the tissues. Internally, they are used to control hæmorrhage or to check diarrhoea, and act in two ways. The so-called constringents coagulate the albuminous tissues in the mucosa, and thus interfere with the circulation and diminish the amount of exudation through the walls of the vessels; of this class are tannic and gallic acids, the persalts of iron, alum, catechu, kino, krameria, and cinnamon. The dilute mineral acids, acetate of lead and nitrate of silver, on the other hand, cause contraction of the vessels, and so arrest hæmorrhage or diminish exudation. Locally, astringents are used to reduce the exuberant granulations of ulcers or are applied to chronically inflamed mucous membranes to diminish secretion. Nitrate of silver, sulphate of copper, and alum are the chief local astringents; they are used in the solid or liquid form, or as a spray.

ASYSTOLISM is a word much used by Beau and other French writers to express an inability on the part of the right ventricle of the heart to empty itself of its contents, a condition met with especially in the later stages of

mitral incompetence. The term has not come into general use.

ATELECTASIS AND COLLAPSE of the Lungs.—The former term implies the absence of expansion of the lungs at birth—*i.e.*, the retention of the foetal condition; whilst the latter implies that lung tissue, previously expanded, has become airless.

Collapse may be brought about by mechanical hindrance to the entrance of air to the whole or any part of either lung, or by the absence of inspiratory traction. In children complete collapse of a whole lobe is sometimes found, the lung tissue appearing perfectly airless. This condition is of purely mechanical origin, although formerly supposed to be the result of inflammation, and described as lobular pneumonia.

The commonest forms of mechanical hindrance to the entry of air are—

(a) Obstruction of the upper air passages by a solid body, or by mucus as in bronchitis; pressure from without, as by aneurysm, enlarged glands, or any form of tumour; spasm of the circular muscular fibres within the walls of the finer tubes.

(b) Pressure exercised upon the lung by solid, fluid, or gaseous accumulations in the pleural cavity. The condition of the lung in cases of pleural effusion is a result of collapse combined with œdema, and is generally termed “carnification.”

To the absence of inspiratory traction must be ascribed the collapse of the margins and of portions of the lower lobes of the lungs, which often occurs independently of bronchial obstruction. The effect of weakness of the chest walls, or of their muscular coverings, as a contributing cause in the production of atelectasis, is seen in the frequent occurrence of the condition in rickety children. The smaller tubes being most subject to obstruction from the inspiration of sticky mucus, it follows that collapse of small tracts occurs most frequently at the surface of the lung. Finally, the gases of the residual air are absorbed by the capillaries of the part, and the vesicles collapse from the natural elasticity of their walls. The collapse of larger tracts, sometimes of a whole lung, is usually associated with the presence of air or fluid in the pleural cavity, being due in the one case to disturbance of the natural pneumatic relations upon which normal inspiration depends, and in the other to direct mechanical pressure.

The appearances presented by limited areas of collapse on the surface of the lungs are quite characteristic. Each area is sharply defined, with an angular outline corresponding to that of the lobules affected, sunken below the surface, of a dark purplish colour, somewhat wedge-shaped on section, non-crepitant, and with a glistening surface. If there be also œdema, fluid will exude on pressure.

Symptoms.—Dyspnœa, more or less constant, and a varying degree of cyanosis, are the only symptoms which can be directly attributed to atelectasis. Recent collapse of any considerable tract of lung tissue of necessity adds gravity to the symptoms of whatever condition may have produced it, materially reducing, as it does, the extent of lung available for respiration. This is especially the case in broncho-pneumonia, of which affection atelectasis is an important feature.

Physical Signs.—When, as is usually the case, the areas of collapse are small and scattered irregularly through the lungs, no definite physical signs may be produced. If extensive, the breath sound is absent, and there may be dulness on percussion. When any considerable tract of lung—the whole of a lobe—has undergone collapse, a distinct depression of the chest wall may be present. In cases of collapse due to intra-pleural pressure, the place of the shrunken lung is taken by the fluid or air which has given rise to the condition, and hence no depression results. Within certain limits a collapsed area of lung is capable of re-expansion, especially in early life. When any plastic adhesive changes have been set up, this is no longer possible, and these changes are most prone to occur in lung tissue collapsed by actual pressure. Hence it frequently happens that the evacuation of fluid pent up for a long time within the pleura is not followed by recovery of the compressed lung, a result in part also due to the thickening of the visceral layer of the pleura, a change almost invariably found when fluid, even though it be a simple serous effusion, has been long present within the cavity. In collapse from plugging or spasm the absorption or removal of the obstruction may be followed by complete restoration of the lung tissue. A low form of pneumonia leading to fibrosis and bronchiectasis frequently follows collapse.

Treatment must be directed towards relieving or removing the conditions which have produced the collapse. Re-expansion may sometimes be assisted,

when urgent symptoms have passed away, by means of the inhalation of compressed air in a suitable apparatus (see AIR, COMPRESSED, THERAPEUTICS OF).
E. C. BEALE.

ATHETOSIS.—This name was given by Dr. Hammond, of New York, to a condition which sometimes follows hemiplegia, and is met with most often in children.

The word means "with no fixed position," and the condition is characterized by slow, involuntary, spasmodic, irregular, and continually changing movements of the paralysed hand and foot, but especially of the former. The fingers and thumb assume various peculiar positions due to spasm of the interossei and lumbricales, but extension of the middle phalangeal joints is most common. The foot is usually in the position of talipes equino-varus, with extension of the big toe. The movements occur during rest, but usually cease during sleep. They are increased by voluntary efforts, which they very much impede. Athetosis only occurs in cases in which some voluntary power has returned, and it accompanies the return of power. Two forms of the disease are observed—(1) In children, without anæsthesia of the affected parts. In such cases epileptic fits often occur in the athetosed limbs. The lesion is probably a thrombosis of the veins of the motor area of the cortex. (2) In adults, sometimes associated with hemi-anæsthesia, but not with epileptic attacks. In such cases the lesion is considered to be situated in the posterior third of the hinder limb of the internal capsule, and in the optic thalamus contiguous to it.

The disease is probably due to irritation of unstable grey matter.

The *prognosis* is unfavourable as regards the cessation of the movements.

Treatment consists of nerve tonics and sedatives, especially the bromides, which are particularly indicated if there be epileptic fits. The uninterrupted galvanic current, with the positive pole at the neck and the negative on the affected arm, is of service in some cases.

C. E. BEEVOR.

ATRESIA is an imperforate condition of some orifice or canal whose lumen should be patent. It may be the result of congenital malformation or of disease.

ATROPHY.—As atrophy of a part

manifests itself by diminution in size, and microscopically by diminution and often disappearance of its constituent elements, it may be defined as a retrogressive change in parts originally well formed and well grown. The causes most potent in inducing atrophy are (1) disuse, (2) diminished blood-supply, (3) injury to nerves, and (4) continuous pressure.

Among familiar examples of *atrophy from disuse*, mention may be made of the shrivelling of the ductus arteriosus, hypogastric arteries, and umbilical vein immediately after birth. After successful lumbar colotomy, the large bowel on the distal side of the artificial anus will become thin and wasted. In the stumps of limbs after amputation, the bones, muscles, nerves, and vessels become reduced in size; the contractile elements of the muscles are replaced by fat, or represented by collections of fatty and fibrous tissue. In amputations so planned that the patient can utilize the stump in walking this atrophy may be in a large measure prevented. After injury to the vas deferens the testicle will atrophy, and in some cases totally disappear.

Many examples of atrophy from disuse are really instances of *atrophy from diminished blood-supply*. It is a well-established fact that organs most frequently used have the best blood-supply—indeed, healthy function and efficient blood-supply go hand in hand. Instances are not wanting to illustrate atrophy from direct interference with the vessels distributed to an organ. Embolism of a branch of the renal artery will cause atrophy of a wedge-shaped portion of the kidney cortex corresponding to the distribution of the plugged vessel. Atrophy of the retina is caused by plugging its central artery, due either to embolism or extension of atheroma from the internal carotid to the ophthalmic artery. Badly adjusted trusses have been known to obliterate the spermatic artery and induce atrophy of the testis. Attempts have been made, by ligature of the nutrient artery, to utilize these effects in practice—*e.g.*, to reduce limbs of inordinate size, as in elephantiasis and congenital giant-limbs; also to check the growth of large tumours which were beyond the reach of legitimate surgery. In a few instances the results have been encouraging.

Atrophy from injury to nerves is seen in the wasting of muscles which follows division or injury of the dominant nerve or nerve centre, a condition of great

interest. Muscles are to be regarded as the peripheral end-organs of motor nerves, in the same sense that the retina is the end-organ of the optic nerve. The atrophy of the thumb muscles following division of the median nerve occurs too rapidly for us to attribute it merely to disuse. Many forms of muscular paralysis, and subsequent atrophy from injury to nerves, are of the utmost diagnostic value in clinical medicine. For example, pressure on the recurrent laryngeal nerve by a thoracic tumour induces atrophy of the principal laryngeal muscles. Atrophy of the muscles supplied by the left recurrent laryngeal nerve is the only constant pathological change found in the larynx of roaring horses. Wasting of one-half of the tongue following injury to the base of the skull is indicative of damage to the atlas or the occipital condyle, implicating the hypoglossal nerve. In paralysis of the fifth cranial nerve the muscles of mastication on the affected side waste more rapidly than when simply disused, as in cases of excision of the lower jaw.

There is an interesting form of this change to which the term "correlated atrophy" may be conveniently applied. In cases of successful amputation at the hip-joint or upper third of the thigh the corresponding os innominatum will become thin and light, the aorta narrower, and the heart distinctly smaller. Such changes are a combination of diminished use and limitation of blood supply. The change in the heart is what would be expected: it is a muscular organ developed according to the amount of work required of it, and as the lower limb represents about one-fourth of the total body weight, its removal ultimately diminishes the work which the heart is called upon to perform. When the operation is performed without much loss of blood, a remarkable tumultuous action of the heart may occur and last for several days. In medical practice this correlated atrophy may be well studied in the nervous system; destruction of the corpus striatum by hæmorrhage is followed by atrophy of the motor tract of the crus cerebri (crusta) and of the lateral tracts of the cord. These facts have been utilized by experimentalists to trace the course of the various tracts in the spinal cord. There is also reason to believe that, in old-standing cases of paralysis of the leg, diminution or atrophy of the convolutions occurs in the leg area of the motor region of the cerebral cortex. In the same group must be placed the atrophy of the anterior

quadrigeminal bodies when the eyes have been extirpated in young animals.

We have now to consider *atrophy from continuous pressure*. Among the many examples of this common form of atrophy may be mentioned the thinning of the skull bones in cases of intra-cranial tumours, especially cysts. The pressure of hydatid cysts lodged in the brain of sheep will produce holes in the bone, and allow the cyst-wall to project beneath the skin. The erosion of bone from the continuous pressure of aneurysms is a well-known example. Loose bodies in joints will often hollow out recesses in the heads of bones, and the continuous pressure exerted by the dislocated head of a femur or humerus will rapidly form a new, and often useful, joint-socket. It is by continuous pressure that cystic tumours of the abdomen often open into the intestine, rectum, or bladder; or cysts in opposite ovaries will unite and form intercommunicating chambers, and hydatid cysts open into the peritoneum.

As a physiological process atrophy manifests itself in a variety of ways. The modifications of larval forms furnish many wonderful examples—*e.g.*, the disappearance of the external gills in young sharks, in tadpoles, and the Alpine salamander; the loss of the tail in ascidian tadpoles, and in anurous batrachians; atrophy of the remarkable sucking disc in the young lepidosteus, and, returning to man, the disappearance of Peyer's glands in advanced life.

In the mammalian embryo atrophy from continuous pressure is responsible for the formation of a single median vessel from two parallel trunks; of a single median uterus from bilateral oviducts; of single ducts to an aggregation of glands, and for the communication of the third with the lateral ventricles of the brain.

From a physiological and pathological point of view atrophy is a process of much interest, and produces conditions of great importance in animal organizations of all kinds, from the simplest to the most complex.

J. BLAND SUTTON.

ATROPHIA CUTIS is a term applied to various changes in the skin characterized by the diminution or disappearance of certain of its elements.

Senile Atrophy is an expression of the general degenerative changes of advanced life. The skin is thin, loose, wrinkled from the absorption of subcutaneous fat, and generally discoloured.

Troublesome itching (*pruritus senilis*) is often complained of. The hair falls off, and the sebaceous glands are destroyed or blocked and distended, but the sweat glands are unaltered. Small, warty, brownish elevations, which can be detached by the finger-nail, are common on the trunk, neck, and arms (*verrucae seniles*).

The cases described as general idiopathic atrophy of the skin closely correspond to the hide-bound condition of diffuse scleroderma.

Lineæ Albicantes are the result of extreme stretching of the skin, and the consequent forcible separation of bundles of connective tissue, which become parallel to one another, and remain so. Minute hæmorrhages result from the rupture of blood-vessels, so that the lesions are at first pink and sometimes even raised, but after absorption of the blood, linear, glazed, white, atrophic scars are left. They are commonest on the abdomen of females as the result of pregnancy, on the mammae from lactation, but may be found over any form of prominent, rapidly formed tumour, and are frequently a striking feature in cases of diffuse lipomata.

Neuralgia, injuries to nerve-trunks, progressive muscular atrophy, tabes dorsalis, and acute rheumatism are sometimes accompanied or followed by a tropho-neurotic condition known as glossy skin. It chiefly affects the fingers, the skin of which becomes painful, pinkish, tightly stretched, glazed, and sometimes ulcerates. The nails are often involved; they become curved, their matrix exposed and ulcerated from retraction of the skin. Persistent neuralgia, especially of the fifth nerve, is sometimes followed by atrophic scarring.

Striæ Atrophicæ are lesions similar in all their objective characters to lineæ albicantes, but having no known etiology. They are commonest about the buttocks and thighs, and are probably due to perverted innervation.

Maculæ Atrophicæ are round or ovalish, white, depressed spots of thinned skin, varying in size from a pin's head to a threepenny-piece, most common in women about the neck and trunk. As they give rise to no subjective symptoms, their early stage is seldom observed; in it the spots are raised, hard, pinkish, or surrounded by a purplish, vascular halo, and, indeed, are identical with minute spots of scleroderma, with the localized or diffuse forms of which they are frequently associated. The disease is very chronic,

lasting for years, but tends to ultimate spontaneous recovery, the little depressed spots filling up almost completely.

In none of these affections is treatment of any avail. J. J. PRINGLE.

AUSCULTATION, or listening, is a means of diagnosis applicable to any of the internal organs of which function or movement produces sound. It is chiefly employed in the physical examination of the heart and lungs. Auscultation may be practised directly, by applying the ear to the chest wall, or mediately, by means of a stethoscope. The forms of stethoscope in common use are the rigid tube of wood, vulcanite, or metal, with broad ear-piece and narrow chest-piece, and the flexible, single or binaural, instrument. The first has the advantages of enabling the auscultator to appreciate any abnormal impulse of the heart or of an aneurysm, and also that it can be applied to the chest when covered with a layer of clothing, whereas the flexible instrument must be applied accurately to the skin itself. The binaural stethoscope, however, is more convenient for the examination of children and of patients in the recumbent position.

AUSCULTATION OF THE HEART.—Two factors are concerned in the production of the first sound of the heart—(1) the contraction of the ventricles, and (2) the closure and sudden tension of the mitral and tricuspid valves. The sound resulting from muscular contraction is long and low pitched, whilst that produced by the sudden tension of membranous structures, like the cardiac valves, is short and high pitched; the normal first sound is the resultant of these two factors. In disease, if the former element predominate, as in hypertrophy, the sound is prolonged and of low pitch; if, on the other hand, the muscular force be feeble and the cavities dilated, the sound, owing to the predominance of the valvular element, becomes short and high pitched. In the production of the second sound there are also two factors—(1) the closure of the aortic and pulmonary valves, and (2) the sudden tension of the aorta and pulmonary artery. If the blood tension in either vessel be raised, the elastic recoil will be more forcible, and a louder or *accentuated* sound will result. When the factors concerned in the production of either sound of the heart do not come into operation synchronously on the two sides, either sound may be double

instead of single, a condition to which the term *duplication*, or more commonly *reduplication*, is applied. It is a change frequently observed, and is probably due to alterations of tension either within the heart or in the aorta or pulmonary artery. If one of the normal sounds be replaced, or obscured by a sound having a blowing character, a *murmur* or *bruit* is said to be present, the name given to it corresponding with the period of the cardiac cycle in which it occurs. If in the period of auricular systole, it is termed *presystolic* or *auricular systolic*; if in that of ventricular systole, *systolic*; if during the diastole of the ventricles, *diastolic*; and should it immediately follow the first or second sound, *post-systolic* or *post-diastolic* (see HEART, DISEASES OF VALVES).

All murmurs should be timed by the carotid pulse, *not by their relation to the apex beat* (see PALPATION).

The following views as to the mode of production of murmurs are, it is believed, now generally accepted:—

1. All murmurs are due to sonorous vibrations occurring in the blood stream, the result of friction of the particles of the blood against each other.

2. This friction is induced by eddies or oscillations, which originate during the passage of the stream through a narrow into a wider part of the vessel.

3. Murmurs are primarily independent of the condition of tension of the structures forming the orifice, and are chiefly affected by the rapidity of the flow.

4. The primary vibrations in the stream may be varied by certain conditions of the orifice and valves.

5. These primary vibrations may produce secondary vibrations in the containing vessel and neighbouring parts.

The most frequent cause of murmur is some change in one of the cardiac valves permitting of reflux into the cavity which it guards, or producing a narrowing of the orifice.

Cardiac murmurs may also be present without structural change in the valves or orifices, especially in anæmia and chlorosis, and, when the action of the heart is excited. Such sounds are termed *anæmic* or *hæmic* and *functional* murmurs respectively.

Hæmic murmurs are described in the article on CHLOROSIS.

Sounds closely resembling those resulting from organic disease of the valves, but really produced outside the heart, are of frequent occurrence, and are termed *false* or *cardio-pulmonary* murmurs.

The various conditions which may give rise to these murmurs may be classified thus:—1. Displacement of, or pressure upon, the heart, the result of disease of the (a) lung, (b) pleura, (c) thorax, or (d) abdomen. 2. Effusion into the pleural cavity. 3. Changes in the pleura of the præcordial area. 4. Changes in the lung overlying the heart. 5. Changes in the pericardium.

1. (a) *Displacement of the Heart, the Result of Disease of the Lung.*—As a result of the contraction of a cavity, say in the apex of the left lung, the heart is frequently found displaced upwards. Under these circumstances a systolic murmur is often heard in the second or third left interspace, having its maximum intensity about 2 inches from the edge of the sternum. The presence of the cavity, and of the indurated lung surrounding it, intensifies the murmur, which may be so distinct as to be audible over the greater part of the left chest. This sound, though more commonly suggesting aortic disease or a hæmic murmur in the pulmonary artery, may be mistaken for the murmur of mitral regurgitation. When the presence of the cavity is detected and the displacement of the heart recognized, the differential diagnosis should not be difficult, especially when the somewhat rare association of phthisis and valvular disease is borne in mind.

- (b) *Pressure upon the Heart, the Result of Disease of the Left Pleura.*—Perhaps of all the false murmurs none are more common, or present greater difficulties in diagnosis, than those caused by pressure upon the heart resulting from the contraction of the left side of the chest after an attack of pleurisy. The pleura is probably thickened, and the lower lobe of the left lung partially collapsed, and at each systole a sound is produced by the sudden impact of the heart displacing the air in the larger bronchi. This may be audible not only at the apex and in the axilla, but also at the angle of the left scapula, in the trachea, and in the mouth.

In one case observed by the writer, a systolic murmur produced in this manner was distinctly audible at a distance of more than a yard from the patient. In this case an aneurysm of the aorta with pressure on the trachea had been suspected. This murmur may be present even during attacks of functional palpitation.

- (c) *Displacement of the Heart from Deformity of the Chest.*—Murmurs originating from this cause are occasionally met

with. In a case under the care of the writer the lower part of the sternum was depressed to such an extreme degree that by careful measurement it was clear that its posterior surface was only separated from the spine by a distance of about two inches. The chest was shaped like a crescent with blunted horns, the left one holding the heart, which could be, so to speak, grasped by the hand and all its movements distinctly felt. In that case a loud systolic murmur was present.

(d) *The Upward Pressure of a Large Effusion into the Peritoneal Cavity* is sometimes the cause of a false murmur, systolic in time, and audible at either the base or apex of the heart. When the fluid is withdrawn by paracentesis, the murmur disappears.

2. *Effusion into the Pleural Cavity*.—In some cases of pleural effusion, more frequently when the left side of the chest is affected, a loud and prolonged systolic murmur may be heard either near the apex or at the base of the displaced heart. Such a condition is likely to produce a murmur either in the pulmonary artery or in the aorta by pressure upon the vessel, or, what is more probable when the murmur is localized at the apex, within the ventricle itself. The murmur completely disappears on the removal of the fluid from the chest.

3. *Changes in the Pleura of the Præcordial Area*.—The sounds simulating cardiac murmurs resulting from this cause will be found described under FRICTION SOUNDS.

4. *Changes in the Lung overlying the Heart*.—In the subjects of pulmonary phthisis it is very common to hear a systolic murmur about the apex of the heart which closely resembles the murmur of mitral regurgitation. The sound is caused by the impact of the heart upon lung tissue partially consolidated, producing an audible sound by displacement of the air in the bronchi in a similar way to that already described. It is almost always most distinct during expiration, is superficial, high pitched, and disappears when the breath is held after a deep inspiration, and often becomes inaudible when the patient lies down. This murmur may sometimes be heard in the axilla and at the angle of the left scapula. The most common site of a murmur thus produced is not, however, at the apex of the heart, but in the second left intercostal space, about 2 inches from the sternum. In doubtful cases of early phthisis of the left upper lobe, the pre-

sence of this morbid sound is strongly suggestive of lung consolidation. In many of these cases, however, it is possibly due to some displacement of the pulmonary artery, the result of the disease of the neighbouring lung.

5. *Changes in the Pericardium*.—The characters of the pericardial friction sound are described under FRICTION SOUNDS and in the article on DISEASES OF THE PERICARDIUM. False murmurs, when due to chronic changes in that membrane, are frequently heard at one particular spot—viz., the sixth left interspace and over the seventh rib close to the base of the ensiform cartilage. Here the right ventricle is in contact with the chest wall, and it is on its anterior surface that the “white patch” is most commonly found. The sound produced by the movement upon each other of the pericardial surfaces at this spot is systolic in time, usually short, sharp, localized, and superficial; it seldom acquires a blowing character. In fact, it often resembles more nearly a rough re-duplication of the first sound than a murmur. It is perhaps doubtful whether the altered sound, which is so commonly heard at this spot, is in all cases due to the presence of a “white patch” on the pericardium. It is especially common in emphysema with downward displacement of the heart. The effect of change of position upon this murmur is variable. It may disappear entirely when the patient is in the recumbent position, as often happens with friction sounds audible elsewhere over the heart, whilst at times it is hardly at all affected by such a change. When the heart is not displaced, a murmur presenting similar characters may often be heard in the fifth left interspace close to the sternum. Thickening of the pericardium of the left auricular appendix occasionally produces a rough systolic murmur in the second left interspace.

The following precautions should be observed in the examination of all cases presenting murmurs. Assuming that the presence or absence of those consecutive changes in the heart which are almost invariably associated with disease of any given valve has been noted; if there be still room for doubt, the following points must be observed carefully:—

1. The exact period in the cardiac cycle occupied by the murmur. False murmurs are often not exactly synchronous with the commencement of systole or diastole; they may precede or follow the one or the other.

2. The site of maximum intensity and the line of conduction of the murmur. These do not usually coincide with what is found with similar murmurs of organic origin.

3. The condition of the lungs. With doubtful apex murmurs evidence of pulmonary engorgement is strongly in favour of organic valve disease, as that condition is almost invariably absent in the reflux of anæmia.

4. The effect of change of position upon the sound. *It is essential to examine every case of suspected valve disease both in the standing and recumbent position.* It may be stated with confidence that an opinion given in a doubtful case without observing this precaution is of no value. Functional and false murmurs often disappear when the patient lies down, whilst an organic murmur, especially that of mitral stenosis, may be only audible in that position. A murmur which suddenly and completely disappears when the patient lies down, provided there be not at the same time any marked alteration in the pulse-rate, is almost certainly not due to organic disease of a valve.

5. It is important in all cases to auscultate the trachea. A murmur audible in the trachea may be due either (1) to the conduction of the murmur of aortic stenosis; or (2) to the impulse of an aneurysm; or (3), to the impulse of the heart causing an air wave in the bronchi and trachea, this latter being by far the most common cause of tracheal murmurs. Mitral murmurs are not audible in the trachea.

6. False murmurs often disappear completely when the breath is held.

7. The state of the pulse may at once negative a suspicion of organic disease founded on the presence of a murmur.

J. K. FOWLER.

AUSCULTATION OF THE LUNGS (BREATH SOUNDS).—It is a misfortune to medicine, a reproach to those who practise it, and a source of great difficulty to students, that the nomenclature of the auscultatory sounds should be in such a state of confusion. As uniformity in this respect can only be obtained by sinking individual preferences and submitting to the dictates of authority, the terminology recommended by the majority of the contributors to the Provisional Report of the Committee of the International Medical Congress has been adopted in this and the following article.

A knowledge of the normal breath sounds is obviously an essential preliminary to the auscultation of the chest in disease. This can only be obtained by the examination of a large number of healthy subjects. Three varieties of respiratory sounds are to be recognized in every healthy chest—(1) the sound produced in the glottis, and audible over the lower end of the trachea, which is termed “tracheal” or “bronchial” breathing; (2) the sound produced in the alveoli and audible over the lungs, termed “vesicular” breathing; (3) the sound audible about the roots of the lungs which combines the characters of the two preceding, and is termed “broncho-vesicular” breathing. As the normal respiratory sounds vary considerably in intensity in different individuals, there is no common standard of reference, and one side of the chest must always be compared with the other. Any change in the *quality* of the sounds, however, is to be regarded as abnormal.

The varieties of respiratory sounds, normal and abnormal, may now be more fully described:—

Vesicular Breathing.—This is a soft rustling sound audible during inspiration. It is generally followed, without any appreciable interval, by a fainter sound, of shorter duration, and blowing quality, heard during expiration; but this may be absent. The two sounds constitute the normal respiratory murmur audible over the healthy lung.

Prolonged Expiration.—The expiratory sound may be prolonged—a sign the significance of which varies with the pitch and quality of the sound. If high pitched and bronchial or tubular in quality, it indicates consolidation of the lung; if, on the other hand, the pitch be low and the quality faintly blowing, but not bronchial or tubular, emphysema is probably the cause, or it may be due to the presence of a cavity in the lung, either distant or of small size.

Exaggerated Breathing.—This is a sound possessing the characters of vesicular breathing in an exaggerated degree. It is the normal breath sound of children, but when met with in adults indicates that an increase of function in one part is compensating for deficient action elsewhere.

Exaggerated breathing is perhaps best heard over the unaffected side in cases of pleural effusion.

Diminished Breathing.—The characters of the normal breath sound are retained, but the intensity is much diminished. It

is present under a variety of conditions, involving lessened functional activity of the lung, and very commonly at the apex in the early stage of phthisis.

Suppressed Breathing.—The breath sound is absent, a condition met with in cases of pleurisy with effusion, also in certain cases of pneumonia, when the bronchi are filled with exudation (massive pneumonia), and in complete occlusion of a bronchus from any cause.

Interrupted Breathing: Wavy or Cog-wheel Breathing.—The inspiratory sound is divided into two or three parts, owing to an irregular expansion of the lung, the result of disease of either the bronchi or the lung interrupting the entrance of air, or of irregular contraction of the muscles of respiration. It may be heard at the apex of the lung in phthisis, but is an untrustworthy sign owing to its close simulation by the breath sound present in certain nervous conditions. It is also occasionally simulated by a succession of "air-wave" murmurs (cardio-pulmonary) produced by the impact of the heart upon the lung.

Bronchial Breathing is the glottic sound, as heard in the normal chest near the lower end of the trachea, over the seventh cervical spine. The sound there audible may be taken as the standard of comparison by which to gauge the quality of similar sounds heard elsewhere in the chest of the same patient, the term "bronchial breathing" being used to signify that the sound heard over an area of disease in the lung is of the same quality as that audible over the seventh cervical spine. It is of variable intensity, and differs from vesicular breathing in that the inspiratory sound is higher in pitch and tracheal in quality, whilst the expiratory sound is separated from the former by a distinct interval, is tracheal in quality, usually more intense, and of equal or longer duration.

When heard in phthisis or pneumonia it signifies the presence of consolidation in an area of lung; in large pleuritic effusions it may be audible over the site occupied by the lung, and indicates that it is compressed or collapsed. It is occasionally audible over the whole of the affected side in cases of pleural effusion, especially in children; when so audible in the case of adults it is considered by some writers to indicate the existence of positive intra-thoracic pressure; as, however, it is occasionally present in cases of moderate effusion in which there is no displacement of the heart, that statement cannot be absolutely accepted. It

probably indicates that the large bronchi of the collapsed lung are still patent. When a thoracic aneurysm or mediastinal growth is situated between a large bronchus or the trachea and the chest wall, bronchial breathing is often audible over the area occupied by the tumour.

Broncho-vesicular Breathing, as the name implies, combines the characters of bronchial breathing with those of the normal respiratory sound, and indicates the presence of an amount of consolidation short of that necessary to produce bronchial breathing. It is heard normally over the sternal portion of the infra-clavicular regions in front and the upper part of the inter-scapular region behind. In the inspiratory sound the vesicular quality is diminished, but not absent; the tracheal quality is more or less marked, according to the degree of consolidation; the pitch is raised in proportion as the tracheal quality predominates over the vesicular; the intensity is variable.

The pitch, tracheal quality, and length of the expiratory sound correspond with the characters of the inspiratory sound.

Tubular Breathing is the glottic sound conducted through an area of lung completely consolidated.

Tubular breathing and bronchial breathing are often used as synonymous terms, but the former sound differs from the latter in possessing a "whiffing" character and in its higher pitch.

It is heard typically in lobar pneumonia, when the bronchi are patent; when present in phthisis, it usually indicates that a portion of lung situated near the surface is *completely* consolidated, the bronchi being patent.

Cavernous Breathing is a modification of the glottic sound produced by the presence of a cavity within the lung or external to it, in communication with an open bronchus.

The inspiratory sound is low pitched, hollow, and blowing; the expiratory sound is still lower in pitch, has the hollow, blowing character more marked, and is usually more prolonged.

It requires a partially empty cavity, in communication with an open bronchus, and at least equal in size to an unshelled walnut, to produce a breath sound of this character.

The breath sound audible over the supposed cavity should always be compared with that over the lower end of the trachea, as errors in the diagnosis of

cavities are of frequent occurrence owing to the neglect of this precaution.

Amphoric Breathing is a sound of variable intensity presenting the hollow blowing character of cavernous breathing, in an exaggerated degree, and with the addition of a distinctly "metallie" quality.

It indicates the presence of a large cavity either in the lung or external to it in the pleura, in communication with an open bronchus.

The differences between vesicular, bronchial, tubular, cavernous, and amphoric breathing may be expressed in tabular form thus:—

Vesicular Breathing.

(I. = inspiration; E. = expiration.)

	Pitch.	Quality.	Interval.	Duration.	Intensity.
I.	low	vesicular	none	E. shorter than I. or	variable
E.	lower	blowing		absent	faint or absent

Bronchial Breathing.

I.	high	tracheal (seventh cervical spine)	distinct	E. equal to or longer than I.	variable
E.	higher	do.			greater

Tubular Breathing.

I.	higher than in Br. br.	laryngeal or whiffing	distinct	E. equal to or longer than I.	variable
E.	higher	do.			greater

Cavernous Breathing.

I.	low	blowing and hollow.	distinct	E. longer than I.	variable
E.	lower	both characters more marked.			greater

Amphoric Breathing.

I.	low	hollow and metallic	distinct	E. longer than I.	variable
E.	lower	both characters more marked			greater

J. K. FOWLER.

AUSCULTATION OF THE LUNGS (ADVENTITIOUS SOUNDS).—A great variety of sounds to which, as a whole, the above term is applied become audible in diseased conditions of the lungs, bronchi, and pleura:

Friction Sounds will be found described under that heading.

Rhonchi are dry musical sounds produced in the bronchial tubes. When low pitched, loud, and snoring in character, they are termed *sonorous rhonchi*; when high pitched and whistling, they are called *sibilant rhonchi*; the pitch of the sound being chiefly dependent upon the calibre of the tube in which it is produced. Sonorous rhonchi usually indicate that mucus is present in the large tubes; sibilant rhonchi, that the lining membrane of the smaller bronchi is swollen. The former often disappear when the patient coughs; the latter are usually uninfluenced by cough.

Rhonchi may be audible during either inspiration or expiration, or may accompany both parts of the respiratory act; in bronchitis they are often especially marked during expiration.

Stridor is a harsh vibrating sound resulting from obstruction of the larynx, trachea, or a main bronchus. This sound may be caused by a variety of local conditions, but is most often due to compression of the trachea by an aneurysm, an enlarged thyroid, or an intra-thoracic tumour. Paralysis or spasm of the vocal cords, the result of pressure on the recurrent laryngeal or pneumogastric nerves and cicatricial changes within the larynx or trachea, may also produce stridor.

Râles are moist sounds produced by the bubbling of air through fluid in the alveoli or bronchi, and by the separation of the moist surfaces of the swollen mucous membrane. They vary much in character, being chiefly influenced by the condition of the lung, as regards sponginess, consolidation, softening, or excavation, in the neighbourhood of which they are produced. The presence of consolidated lung gives a sharp, crackling, explosive quality to the sound, whereas, when the surrounding lung is of spongy texture, the sound is usually of a bubbling character. Sounds of the first variety are termed (1) small, (2) medium, and (3) large crackling râles.

(1) *Small Crackling Râles* are sharply defined crackling sounds of small size, chiefly audible during inspiration, but also during expiration.

They indicate the presence of fluid in

the finer bronchi, the surrounding lung being usually consolidated. Sounds of this character are present when a tubercular deposit or pneumonic exudation is undergoing softening.

(2) *Medium Crackling Râles* are sounds presenting the same general characters as the above, but of larger size. They are met with under the same conditions.

(3) *Large Crackling Râles* are sounds produced at the site of softening in the lung when the process has extended to such a degree that small cavities, the size, perhaps, of a pea or hazel-nut, have formed, the surrounding lung being still consolidated. They are usually fewer in number than either of the former varieties. Râles of this character are of frequent occurrence in phthisis, and are also heard when a pneumonic area is breaking down.

Moist sounds produced in the neighbourhood of spongy lung are termed (1) small, (2) medium, and (3) large bubbling râles.

(1) *Small Bubbling Râles* are sounds differing from the corresponding râle of the former variety in that they are less sharply defined, and suggest the bursting of a soft bubble rather than the explosion of a minute shell. They are produced by the passage of air through mucus in the bronchioles, the surrounding lung being of spongy texture. Sounds of this character are heard in cases of capillary bronchitis, especially in children.

(2) *Medium Bubbling Râles*.—These sounds are similar in quality to those above described, but are produced in larger tubes, and are therefore of larger size.

(3) *Large Bubbling Râles*.—The character of these sounds is almost sufficiently indicated by the name. They are produced in the larger bronchi and trachea by the passage of air through frothy mucus, and are heard in cases of bronchitis and pulmonary engorgement when the vital powers are failing.

Gurgling.—Large liquid sounds of a character indicated by the name, produced in a cavity in the lung, and best elicited by making the patient cough.

Clicking Sounds.—The character of these sounds is best illustrated by whispering the word "click." They differ from râles in being sticky rather than moist in quality; they are produced during inspiration only, and are most often heard at the apex of the lung in phthisis. The presence of "clicks," as they are generally termed, indicates the com-

mencement of softening in a tubercular deposit.

These sounds are not distinguished by German writers from crackling râles, and it must be admitted that the difference is but slight and with difficulty appreciated by students of auscultation.

Crepitation is a sound almost exactly similar to that produced by rubbing the hair between the fingers close to the ear.

The use of the term should be strictly limited to sounds of this character—*i.e.*, to the sense in which it was employed by Laennec.

Crepitation is caused by the passage of air into vesicles either containing a fibrinous exudation or in a condition of collapse.

It is heard typically during the latter part of inspiration in the early stage of pneumonia, and also at the bases of the lungs when in a state of œdema, lobular collapse, and hypostatic pneumonia.

Metallic Tinkling.—When a moist sound is produced in a large, dense, walled cavity (pulmonary or pleural), or in a neighbouring bronchus in communication with it, the sound acquires a peculiar quality, which is best described by the terms "metallic" and "tinkling."

Succussion Splash.—A peculiar splashing sound, described by Hippocrates, is produced by the sudden movement of air and fluid in a cavity. It is present in cases of hydro- or pyo-pneumothorax, and is elicited by shaking the patient or making him cough.

Bell Sound.—When air is present in the pleural cavity (pneumothorax), if a coin placed flat upon the chest be struck with another coin, a sound like the tinkling of a bell will be audible through the stethoscope applied over the affected area.

J. K. FOWLER.

AUSCULTATION OF THE VOICE (Vocal Resonance).

—The voice sounds, as heard over the healthy lung, are diffused, distant and low pitched. They vary in intensity in different individuals, being chiefly dependent upon the quality of the voice. They are *diminished* in intensity by the intervention of any badly conducting medium between the lung and the chest wall, a condition present in pleurisy with effusion, in thickening of the pleura, and in pneumothorax; by occlusion of the bronchi, owing to the presence of morbid growths in the lung or mediastinum; or of solid fibrinous exudation filling the tubes, as occasionally occurs in croupous pneumonia (massive pneumonia); and by the

extremely spongy condition of the lung present in emphysema. The voice sounds are *increased* in loudness, but without alteration in pitch, when a degree of consolidation of the lung is present insufficient to produce bronchophony, or when the voice is transmitted through a cavity not surrounded by consolidated lung (Flint). The vocal resonance is normally more intense in the neighbourhood of the trachea and large bronchi than elsewhere, and in the right infra-clavicular region than in the left. The conduction of the whispered voice is modified by the same conditions which affect the loud voice, and in a similar manner.

Bronchophony is a sound of variable intensity characterized by concentration of the transmitted voice, elevation of pitch, and a degree of nearness to the ear, falling short of the condition requisite for pectoriloquy—*i.e.*, the sound, though seeming to originate near to the end of the stethoscope, passes away from the observer, and does not appear to have been spoken from the end of the instrument straight into his ear. Bronchophony is usually found with bronchial breathing, and has the same significance. It is normally present over the lower cervical spines, in the upper part of the inter-scapular region, and over the sternal portion of the infra-clavicular regions.

Pectoriloquy is by some writers considered to be merely an exaggerated de-

gree of bronchophony. It differs from it, however, in the fact that, whilst in the latter the *noise* only is transmitted, in pectoriloquy *articulate speech*, in addition to sound, becomes audible. Pectoriloquy has been divided into "bronchophonic pectoriloquy" and "cavernous pectoriloquy," the one form indicating the presence of consolidation of the lung, the other, of a cavity. If pectoriloquy be accompanied by the characters of bronchophony (nearness to the ear and elevation of pitch) the transmission is by solidified lung; if, on the other hand, speech be transmitted and the characters of bronchophony be wanting, the inference is that the pectoriloquy denotes a cavity (Flint). If words articulated in a whisper be conveyed to the ear of the auscultator, *whispering pectoriloquy* is said to be present. The sign has the same significance as pectoriloquy of the loud voice.

Ægophony is a term applied to a modification of the vocal resonance in which the transmitted sound has a nasal or bleating character. It occurs in pleurisy when the amount of effusion is but moderate, and is most often heard about the angle of the scapula. It is believed by Dr. Stone to depend upon the interception by the exudation of the fundamental vowel tone and the passage of the harmonic overtones.

J. K. FOWLER.

B

BATHS.—Bathing consists in the application of liquids, vapours, or gases—generally or locally—to the surface of the body. The fluid employed for the purpose may be simple, or variously medicated by different substances held in solution or in suspension; and more than one form of bath may be combined in the same application. According to its nature and method of administration, the bath may be heating or cooling in its effects; stimulant, tonic, sedative, depressant, or locally alterative: it always exerts a more or less cleansing and detergent action upon the skin.

Immersion in fresh water constitutes the simplest form of bath; and water in some form is the vehicle by which are applied most of the various other substances which distinguish the several medicated and composite baths.

A. LIQUID BATHS.—The *Cold Bath* has

a temperature below 70° Fahr. The immediate effect of its application is to produce a sensation of cold, gasping respiration (reflex action), and pallor of the skin, with subsequent reaction. Prolonged immersion increases the loss of temperature, and induces vital depression, not followed by reaction, and only slowly recovered from even on removal from the bath. The remote effect of the cold bath, if not too prolonged, is to increase the rate of tissue change and the excretion of urea and carbonic acid; and hence it acts as a general tonic and as a stimulant to the appetite.

The *Tepid Bath* ranges from 85° to 95° Fahr. It acts mainly upon the skin as a sedative, emollient, cleansing, and detergent agent; the pulse, respiration, excretion, secretion, and body-heat are practically unaffected.

The *Warm Bath*, at from 95° to 104°

Fahr., slightly increases the activity of the circulation, and somewhat retards tissue metamorphosis; it is a valuable soothing agent, but in other respects its effects on the system are almost inappreciable.

The *Hot Bath*, at a temperature of from 104° to 110° Fahr., affects mainly the nervous and circulatory systems: it greatly increases the frequency of both pulse and respiration, and is followed by a free perspiration. Special ends are subserved by such partial applications as the hip-bath and the foot-bath.

The effect of any bath upon the skin is much increased by brisk friction both during and after immersion.

The duration of any kind of bath must depend on the age and condition of the bather and the object which it is desired to attain. Cold baths are fitted for the vigorous and healthy, but should never be taken when exhausted, or immediately after a full meal, or if there be reason to suspect congestion of any internal organ. The weakly and debilitated may combine many of the advantages of both the tepid and the cold bath by immersion in, or sponging with, warm water, followed (while still standing in warm water) by the rapid application of a spongeful of cold water to the general surface, or at least to the throat and chest. Asthenic persons should avoid baths, or the immersion should be of the shortest possible duration, and those suffering from any degeneration of the heart or vessels should avoid all but tepid baths. The excessive employment of hot baths exercises a weakening effect upon the system.

The simple liquid bath may be variously medicated, as in the

Sea-water Bath.—This is more stimulant and tonic in its effects than fresh water, and hence is useful in convalescence, in chlorosis, and in strumous disease. It may be given as a cold, tepid, or hot bath, according to circumstances. Sea-water contains about 3 per cent. of soluble salts, and (as regards the action of the solution itself) an efficient substitute can be obtained in inland places by dissolving bay-salt, Tidman's sea-salt, or even common or rock-salt in fresh water. About 4 to 9 lb. of salt may be dissolved in 30 gallons of water, according to the degree of stimulant effect desired. Half a pound of bay-salt dissolved in 4 gallons of cold or tepid water makes a good salt-water sponge bath, to be used every morning, and followed by vigor-

ous rubbing with a flesh-brush or coarse towel.

Acid Bath.—This is considered useful in certain cases of dyspepsia, with sluggish liver and constipation. For a general bath 3jss of nitric acid and 3j to 3iij of hydrochloric acid are added to 30 gallons of warm water in a wooden or earthenware vessel. The patient should remain immersed for about ten to twenty minutes. The more convenient foot-bath is prepared by adding ½ ounce of nitric and 1 of hydrochloric acid to 4 gallons of warm water in a wooden or earthenware vessel; the feet should remain immersed for from twenty to thirty minutes, while the groins, axillæ, and hepatic region are sponged with the solution. This bath is to be used every alternate day for two or three weeks at a time.

Alkaline Bath.—Add 3 ounces of carbonate of potassium, or 6 ounces of carbonate (not bicarbonate) of sodium to 25 or 30 gallons of hot water. It is used in chronic squamous skin diseases, chronic rheumatism, and in lithæmic cases, &c., and should be prepared in a wooden, earthenware, or enamelled bath, as ordinary paint is rapidly affected by it.

Corrosive-sublimate Bath.—This is made by adding hydrargyri perchloridi 3iij and acid hydrochlor. 3j to 30 gallons of water. This bath is sometimes useful in secondary syphilis and in certain skin diseases.

Creasote Bath, used in squamous skin diseases: creasote 3iij, glycerine 3iv, aq. Cxxx.

The following soothing and emollient baths are serviceable in squamous and irritable conditions of the skin; the ingredients are in each case to be added to 30 gallons of water:—

Bran Bath: Boil 1 pound of bran in 1 gallon of water; strain the liquor, and add it to the bath.

Borax Bath: Borax 3iv, glycerine 3iij.

Gelatine Bath: Dissolve 1 pound of common glue in hot water, and add the solution to the plain bath, or to the bran bath, as above.

Starch Bath: Starch 1 pound.

Starch and Conium Bath: Add extr. conii 3j to the starch bath.

The *Iron Bath* (ferri sulphat. 3ss, aq. Civ) is valuable for strumous or rachitic children; it should be used in an earthenware or wooden vessel.

The *Mustard Bath* is a valuable stimulant; it is made by enclosing 2 to 4 ounces of ordinary mustard in a piece of muslin or thin linen and "swishing" it about in 4 gallons of hot water until the latter

becomes yellow. This may be used as a general bath for infants suffering from collapse, convulsions, severe bronchitis, &c.; as a foot-bath for adults in congested conditions of the lungs and brain, or to invigorate a languid circulation; and as a sitz-bath in some cases of amenorrhœa, &c. A child may remain in such a bath until the skin becomes distinctly reddened.

The *Pine Bath* is prepared by adding a decoction of pine-needles—or, more easily, by dissolving some of the commercial pine-extract, or pine-essence, in hot water; it is mildly stimulating, and is employed in hysteria, gout, and rheumatism.

The *Sulphur Bath*: Potassium sulphide $\frac{3}{4}$ iv to $\frac{3}{4}$ viii in 30 gallons of water; a little sulphuric acid may be added. Used in certain skin diseases, in scabies, lead colic, and lead palsy.

All the above baths should be taken warm—i.e., at a temperature of from 95° to 100° Fahr.—and their duration must depend upon the condition of the patient and the object of the treatment.

B. VAPOUR BATHS.—In these the skin is exposed to the action of steam, either alone or combined with the vapour of other substances, which are volatilized at the same time. The vapour bath may be applied, by means of a suitable apparatus, to a limited portion of the body only; or to the whole surface except the head; or the patient may inhale the vapour within a closed apartment, the whole surface being at the same time exposed to its influence, as in the common Turkish and Russian baths. In the vapour bath a higher temperature can be borne than in the hot-water bath, though for a shorter time, since the circum-ambient vapour interferes with heat radiation from the body. The chief value of the simple vapour bath lies in its power of provoking very profuse perspiration, thus relieving the lungs and kidneys and effectually cleansing the skin. An effective form of the

Simple Vapour Bath is readily extemporized by placing a pan containing 3 or 4 inches of boiling water beneath a cane-bottomed chair, on which the patient sits naked; a large blanket, which may be covered by a mackintosh, is thrown over all, and fastened round the neck; one or two red-hot bricks are then placed in the water, and generate abundant vapour. When the perspiration slackens, the skin should be energetically rubbed with a warm dry flannel, and the patient

should retire to bed, clothed in a flannel nightgown.

The *Calomel Bath* and the *Mercurial Vapour Bath* are administered in the same manner—either *locally*, the mingled fumes of the volatilized mercurial salt and of water vapour being directed to some particular region of the body by means of a suitably constructed apparatus; or *generally*, as follows:—The patient sits on a cane-bottomed chair, beneath which are placed two pans, each heated by a spirit-lamp; a flannel-lined oil-cloth or waterproof sheet is thrown over all, and is fastened round the patient's neck. One pan contains boiling water, and the other $\frac{3}{4}$ j to $\frac{3}{4}$ iiij of the bisulphide or of the grey or red oxide of mercury, or 20 to 30 grains of calomel. The skin is thus exposed to the combined action of hot air, steam, and of a volatilized salt of mercury. After a few minutes, perspiration breaks out, and soon becomes excessive. At this stage both lamps are extinguished, and when the patient becomes moderately cool, he puts on a night-shirt and goes to bed. If the full action of mercury be desired, the skin should not be rubbed after this bath. Such combined vapour baths have been largely used in the treatment of secondary syphilis.

C. GASEOUS BATHS are administered after a method similar to that of vapour baths.

The *Hot-air Bath* may be employed in either of two ways, the difference depending upon whether the patient does or does not breathe the heated air. A simple form of the latter kind of hot-air bath can be arranged by seating the patient on a chair, &c., exactly as described for the vapour bath, except that a spirit-lamp only is lighted beneath the chair, no water being employed; or the hot vapour may be introduced by a tube from a suitable apparatus beneath the bed clothes, which are tucked in round the neck of the patient, and secured from contact with his body by some sort of framework or "cradle."

When taking a hot-air bath of the first kind, the patient, after undressing, enters first a room called the *Tepidarium*, the air of which is at a temperature of from 112° to 117° Fahr., and remains there until free perspiration breaks out; he then passes to the *Calidarium* or *Sudatorium*, which is heated by hot pipes to about 130° or 140° Fahr., there he remains for from ten to fifteen minutes; he is then rubbed down and shampooed, after which he is bathed with water at about

85° Fahr. in the *Lavacrum*; then the whole body is soaped and rinsed, and finally the patient reclines on a couch in the cooling-room or *Frigidarium*, until the skin is again quite dry, when he proceeds to dress.

Hot-air baths can be borne of a much higher temperature than vapour baths; they do not so much impede respiration, they provoke more profuse sweating, and raise the temperature of the body to a greater extent.

Hot-air and vapour baths are useful in inducing increased action of the skin, and in catarrhal, neuralgic, and rheumatic conditions. They are effective in reducing some forms of obesity, temporarily at all events, and may be applied locally to rheumatic limbs and enlarged joints with advantage.

The hot-air and vapour, or Turkish, bath is contra-indicated if there be any obstruction to the circulation, if there be fatty degeneration of the heart or vessels or a tendency to vertigo or syncope, and in advanced life, as well as for women during pregnancy and menstruation.

The *Sulphurous-acid Bath* is a means of applying the fumes of burning sulphur to the body. The patient is seated on a cane-bottomed chair, and a blanket or an oil-cloth is thrown round him, the head remaining uncovered. On the floor beneath the chair stands a pan containing a little water. In this is placed a smaller vessel containing brimstone in small pieces, over which a little spirit of wine is poured, and then ignited. The sulphur takes fire, and burns, with the production of sulphurous-acid gas. After using this bath, the patient should at once be removed to another apartment while the doors and windows of that in which the bath has been taken are opened.

The *Sand Bath* is a useful method of applying dry heat—by means of heated sand—to enlarged and stiffened joints in cases of chronic rheumatism.

Many different kinds of medicated and composite baths are available at various health-resorts noted for the natural springs—hot, tepid, alkaline, sulphurated, &c.—which severally distinguish them.

C. E. SHELLY.

BERI-BERI.—A disease widely spread over certain tropical regions, and especially prevalent in India, in Ceylon, on the Malabar Coast, on the East and West Coasts of Africa, and in China and Japan. It is endemic in certain areas, but those who are the subjects of it recover on removing to a non-infected district. It

is believed by some writers to be due to a bacillus, but it is certain that diet has a large share in its causation, and it has been shown that deficiency of nitrogen and an excess of carbo-hydrates in the food are conditions most favourable for its appearance. One form of the disease is thought by some authors to depend upon the presence in the alimentary canal of parasites, especially the *doehmius duodenalis*, and possibly also the *trichocephalus dispar*. It appears in a chronic and acute form. The first symptoms are a sense of fatigue and numbness in the legs, with loss of the knee jerks, followed by paralysis of the extensors, first of the feet, then of the hands, and muscular tenderness. The pulse is very rapid. There is neither fever nor albuminuria, but the patients are anæmic and at the base of the heart hæmic murmurs are often audible. There may be anasarca of the legs, followed by effusions into the pleura and pericardium; or dropsy may be absent, in which case the skin is very dry, and the muscles are seen to be wasted. The acute form of the disease is generally fatal, death often occurring from dropsy; but in the chronic form recovery frequently takes place. A person who has once had an attack is liable to another the next year. The disease is much more common in men than in women.

Treatment.—A strict attention to the diet is the best preventive; the dropsy should be treated on general principles.

BILE, THE.—The bile is secreted by the liver, and is poured out by the bile ducts into the duodenum. It is a golden-yellow or yellowish-green, clear, slightly viscid fluid, with an intensely bitter taste; its reaction is feebly alkaline, and its density is from 1026 to 1032.

The quantity is increased by digestion, reaching its maximum in from five to eight hours after food has been taken; the secretion then diminishes, but never entirely ceases, except under pathological conditions.

Increase of pressure in the circulation of the liver is followed by increase of the secretion; whilst lowering of pressure, as in sudden obstruction of the portal vein, is followed by its diminution or suppression. The diabetic puncture in the floor of the fourth ventricle causes diminution of the flow of bile.

Rutherford, Vignal, and Dodds have shown that most purgatives increase the secretion—*e.g.*, aloes, rhubarb, jalap,

colocynth, cream of tartar, sodium sulphate; but this is especially the case with podophyllum, corrosive sublimate, salicylate of soda, iridin, and euonymin. Calomel produces less decided effects; lead diminishes the secretion.

Great variations are met with in the composition of bile. The following, taken from Hoppe-Seyler, is the mean of five analyses of human bile:—

Water	91.68
Inorganic matter }	
Organic matter	8.32
Mucus	1.29
Taurocholate of sodium	0.87
Glycocholate of sodium	3.03
Saponified fat	1.39
Cholesterolin	0.35
Lecithin	0.53
Fat	0.73

The most important constituents of bile are its *pigments and acids*.

The bile pigment is *bilirubin*, derived by oxidation from the pigment of the blood-corpuscles, oxy-hæmoglobin. By further oxidation bilirubin is converted into a series of colouring matters, of which the green pigment, *biliverdin*, is the ultimate stage.

The bile acids are *glycocholic acid* ($C_{26}H_{43}NO_6$) and *taurocholic acid* ($C_{26}H_{45}NSO_7$). They occur in the form of salts of sodium.

The functions of the bile are said to be: (1) To precipitate the soluble peptone—a very doubtful function, as the action of the pancreatic juice, which reaches the intestine at the same time, must be to re-dissolve the peptone; (2) to emulsify and promote the absorption of *fats*, a much more useful property; it is probably on this account that liver oils are more readily digested than ordinary fats; (3) a diastatic action on starch, which is not constant, is often very slight, and can only be observed in the bile of an animal freshly killed.

Nothing is definitely known about the pathological alterations of the bile. Allusion has already been made to the conditions under which its quantity may vary. In passive congestions it is probably diminished, in active hyperæmia increased, while in all diseases which destroy the liver tissues diminution of bile must follow.

In severe vomiting bile is sometimes quite *blue*, but this is merely the result of an oxidation change of the normal pigments.

Albumen has been found in the bile in

Bright's disease, but the meaning of this is not clear (Vulpian, Frerichs).

Leucin and tyrosin may be present in the bile in various diseases without having any very special significance (Anderson).

In acute yellow atrophy the bile may be colourless (Thierfelder).

In dropsy of the gall-bladder the contents may be quite colourless, but this can hardly be called *bile*.

R. SAUNDBY.

BILHARZIA HÆMATOBIA(*Dis-toma Hæmatobium*).—This is a species of trematode worm, which has been proved to be the cause of the hæmaturia that is endemic in Egypt, various parts of Africa, Arabia, Madagascar, Mauritius, and elsewhere. The sexes are distinct, the female being nearly twice as long as the male, but much more slender. The mode of introduction of the parasite is uncertain; probably it enters the body in the drinking water, but some writers are of opinion that it invariably enters through the urethra in bathing. The worm probably resides in the veins in the region of the bladder and prostate. This is, however, doubted by some writers; it has been found elsewhere, notably in the portal veins. The complete life history is still unknown, but there is almost certainly an intermediary host. Ova have been found in the capillaries of the lungs, kidneys, and skin, and are passed by the sufferers from this disease in enormous numbers in the urine. Their presence in and upon the mucous membrane of the bladder gives rise to the formation of inflammatory granulation tissue, and in one reported case was believed to have been the cause of an epithelial cancer.

The prominent *symptom* is hæmaturia, with the result that the patients are usually anæmic. At the beginning of the disorder small quantities of almost pure blood are passed towards the end of micturition, and later on blood-clots of considerable size. There is generally a good deal of pain in the region of the neck of the bladder and in the urethra, especially during micturition; pain in the buttock is also common. The urine is turbid; it often contains crystals of oxalate of lime and shreddy filaments, branched and curling at their ends, with minute white or yellowish opaque specks in their midst. Under the microscope the filaments are seen to be homogeneous fibres, with mucus cells, forming a stroma in which some ova are imbedded. The sediment to the naked

eye consists of—(1) Minute, opaque, roundish masses, white, yellow, or red, (2) brightly blood-stained cylinders, often branched, and (3) flat blood-clots; microscopically, free ova will be found, together with pus and blood-corpuscles and every variety of epithelial debris from the urinary tract. The egg is a bright, translucent body, ovoid in shape, with a minute spike at one end, and is readily seen, even under a low power. The shell is transparent, and the embryo is plainly visible within, being generally adherent at one or more points to the shell; it is completely surrounded by cilia, by means of which it moves with great rapidity when free. Diluting the urine with ten times its bulk of water suffices to hatch the ova, but the embryo speedily dies in undiluted urine. The period of incubation is quite unknown. In a few instances filariæ have been detected in the blood, probably a mere coincidence. The disease may come on at any age, even as early as three years; it is much more common in the male sex. Children who are attacked usually recover by the time they reach maturity; this is not so likely to occur in adults, but the disease often becomes quiescent.

The *treatment* should be directed to the improvement of the general health of the patient rather than to any attempt to kill the worm by internal or local treatment. In countries where the disease is known to be endemic it will be advisable to avoid bathing, and only to drink water which has been boiled and filtered.

JOHN ABERCROMBIE.

BILIOUS is a popular, not a scientific term. A person is said to be bilious when he has vomiting or diarrhoea, or both, the vomit and motions being highly charged with bile, and with these symptoms there will be anorexia, a furred tongue, and a muddy, jaundiced tint of skin. The theory which the name implies, that such a person is suffering from excessive formation of bile, has no foundation in fact. A rigid attention to diet, with perhaps abstinence from food for half a day, would form the most important part of the *treatment*. Salines and alkalies may be administered with advantage.

BRAIN, ABSCESS OF.—Abscess of the brain is nearly always secondary, the idiopathic form being almost unknown. It is more commonly met with in the white matter than in the grey, and its most frequent seats are the centrum

ovale, the temporo-sphenoidal lobes, and the lateral lobes of the cerebellum.

The *causes* of cerebral abscess may be either *local* or *distant*. Inflammation of the bones of the skull resulting from direct injury, such as a blow or fall on the head with fracture, followed perhaps by caries or necrosis; and suppurative disease of the middle ear are by far the most common local causes of abscess. In the latter case there is usually a history of purulent and possibly fetid discharge from the ear of some years' duration, generally with perforation of the tympanic membrane and earies of the temporal bone. But there may be disease of the middle ear without perforation, discharge, or disease of the bone. By some means, imperfectly understood—it may be by the perivascular and lymphatic canals—infection is carried to the brain, and an abscess results, its most common sites being the temporo-sphenoidal lobe and the cerebellum. Disease of the nose and of the ethmoid bone, syphilitic or not, is also a rare cause. Amongst causes operating from a distance are certain diseases of the lungs and pleuræ, especially bronchiectasis, gangrene, and empyema, and also general pyæmia. Cerebral abscess, however, is not, on the whole, a common complication of pyæmia.

Symptoms.—The disease may run an acute course, or the abscess may be present for some months without giving rise to obvious symptoms. When the abscess follows an injury, after a varying period there may be severe headache, localized to the seat of injury, vomiting and pyrexia, with rigors. The temperature, however, in the majority of cases is low, and the pulse slow, a marked contrast to the conditions usually found in meningitis. Optic neuritis is often present, but is less common and less severe than in cases of cerebral tumour. When abscess follows disease of the middle ear and is situated in the temporo-sphenoidal lobe the symptoms are often very obscure. A purulent discharge may have suddenly ceased, and for some days following the patient may have complained of headache, gradually increasing in severity. He then becomes drowsy and stupid, but there is rarely any definite paralysis. If the so-called motor area be involved, convulsions may occur associated with hemiplegia or monoplegia, but sensation is not affected unless the disease involves the posterior part of the internal capsule. There may be delirium, but the mental condition is more

often one of torpor and indifference to surroundings; this passes on to stupor, which deepens into coma, with brown dry tongue and relaxation of sphincters, when, if not relieved, the patient dies.

In the *chronic* form the condition may be latent for a period varying from a few months to several years, symptoms being absent so long as the abscess remains encapsuled, or there may be occasional complaints of headache with irritability of temper, and sometimes convulsions resembling ordinary epilepsy. The latent period ends suddenly or gradually, the change being marked by increased headache, and possibly by the occurrence of rigors. The symptoms now become those of the acute form, already described.

Localization of the Lesion.—The symptoms of abscess in the motor cortex and in the neighbourhood of the temporal bone have already been indicated. Further indications may be obtained by testing the grasping power of the hands with the dynamometer. Abscess in the frontal region may cause no symptoms beyond mental dulness or melancholia. If the speech centre be destroyed, there will be aphasia, but this symptom may also be present in the case of a large abscess in the left temporo-sphenoidal lobe, compressing the third frontal convolution. In the corona radiata, hemiplegia or hemi-anesthesia may be produced by destruction of the motor or sensory fibres, but abscess in the basal ganglia often causes no special symptoms, unless the internal capsule be involved. The cranial nerves are liable to be affected with abscess situate at the base of the brain. The signs of abscess in the lateral lobes of the cerebellum are often very obscure; pain may be referred to the occipital region, but it is an unsafe guide. If the middle lobe be affected, the gait may be staggering.

The *diagnosis* is often difficult, as the disease may vary in duration from a week in the acute form to many months in the chronic variety. In the acute form, when there is a history of injury or fracture, and when this is followed by localized headache, with tenderness, pyrexia, rigors, vomiting, and perhaps local convulsions in the limbs, the diagnosis is comparatively easy; but in the chronic form, where the symptoms are slight or absent, and the terminal symptoms occur suddenly, it may present great difficulties. In any case of long-standing disease of the ear in which sudden cessation of a discharge is fol-

lowed by headache and increasing drowsiness, the presence of a cerebral abscess is highly probable.

The chronic form has mainly to be diagnosed from tumour of the brain. In the latter the symptoms are more slowly progressive, whilst the rapid development of severe cerebral symptoms after slight indications of brain disease have existed for some time is in favour of abscess, especially if accompanied by considerable fever and rigors (Gowers).

Injury points rather to abscess, but it also gives rise to tumour in some cases. As already stated in the diagnosis of abscess from meningitis, the state of the pulse and temperature is of great importance; the two conditions may, however, be combined.

Pathology.—In the first stage the vessels are much distended, and there is an exudation of leucocytes into the tissues around. The nerve elements then undergo degeneration. The leucocytes increase and form an abscess, which may be ill-defined and surrounded by softened brain substance or may present a distinct capsule. This is formed primarily of delicate nervous tissue which may subsequently develop into a thick fibrous envelope. It is in this way that an abscess becomes encapsuled and latent. The capsule may be completely closed, or in a case of fracture of the skull it may communicate by a fistulous canal with a spicula of bone. The contents of the abscess are usually of a greenish colour, and may have a peculiarly fetid odour. Cerebral abscess may be either single or multiple; in the former case it is usually of considerable size, equal to that of a walnut or a hen's egg. Multiple abscesses are generally smaller.

The *prognosis* is always very grave, unless the abscess can be evacuated by surgical operation; in very rare cases it may become firmly encapsuled, but when well-marked symptoms have occurred such a result can hardly be hoped for.

Treatment.—The possibility that the symptoms may subside and the abscess become encapsuled is so remote that it may be disregarded in the consideration of the treatment to be adopted. Generally speaking, a fatal termination is certain unless the contents of the abscess can be evacuated. Recent advances in cerebral surgery have fortunately rendered this step possible, and the number of cases in which an abscess of the brain has been successfully treated by operation is now considerable.

The most probable situation of the

abscess under various circumstances has already been described.

In the case of injuries to the head the skull should be trephined over the seat of the fracture or blow, unless there be definite localizing symptoms, in which case the indications they afford are a safer guide to the seat of disease. If, on exposing the brain, the surface appear healthy, a grooved or hollow needle should be passed into its substance with the hope of striking the abscess. When found, the pus must be evacuated and a drainage-tube inserted.

In a case recently operated upon by Mr. J. B. Sutton at the Middlesex Hospital, an abscess in the temporo-sphenoidal lobe secondary to caries of the temporal bone was first opened by trephining in the usual position for abscess so situated, but the drainage not being free a second trephining operation was performed, and the bone forming the roof of the auditory canal removed. By this means the abscess was struck again at its lowest point, and its contents were discharged through the canal.

It is possible that when the petrous bone is diseased and the dead bone can be felt, this latter operation will prove the most successful, as the abscess, if found, is necessarily opened at its most dependent part, and free drainage is secured through the auditory canal. The carious bone can also be removed at the same time.

If the abscess be in the cerebellum, its most frequent site is opposite the opening of the internal auditory canal. It may be drained by trephining the occipital bone beneath the inferior curved line and passing a trochar and canula forwards and slightly inwards through the substance of the cerebellum.

For the details of the operations here mentioned, works on surgery must be consulted.

C. E. BEEVOR.

BRAIN, FUNCTIONS OF.—A

knowledge of the functions of the different parts of the brain is absolutely essential for the purpose of exact diagnosis in cases of cerebral disease.

The principle of localization of the functions of the brain was first put on a satisfactory basis by the stimulation experiments of Fritsch and Hitzig in Germany and of Ferrier in this country, and the work has been carried on by other physiologists.

It will be advisable to describe the functions of the different parts of the brain under the following headings:—

Cerebral convolutions, corona radiata and internal capsule, and cerebellum.

It will be observed that in the above list no mention is made of the basal ganglia; formerly the corpus striatum was considered to be the motor and the optic thalamus the sensory ganglion, but the functions originally ascribed to these ganglia are really those of the adjacent parts of the internal capsule, and there are no definite symptoms by which a lesion involving the basal ganglia only can be recognized. The account here given refers to the brain of the Macaque monkey, but the close analogy between the brain of the monkey and man, confirmed, as it is, by the data drawn from pathological observations, justifies us in referring the results obtained by experimentation on the one to the other.

1. The cerebral convolutions contain areas for the representation of (a) movements, (b) sensation, and (c) the special senses.

(a) The so-called *motor area* occupies the convolutions about the fissure of Rolando in each hemisphere—viz., the ascending frontal and parietal convolutions on each side of the fissure, the posterior part of the three frontal convolutions, and the parietal lobule, the continuation upwards and backwards of the ascending parietal convolution. In addition to these, there is the contiguous part of the marginal convolution along the mesial surface of the hemisphere.

Stimulation of this region by a weak Faradic current produces movement in various parts of the opposite half of the body.

To indicate clearly the order in which the motor areas for the different parts of the body are situated in the cortex, it will be well to begin at the mesial line, and then to pass outwards and downwards along the fissure of Rolando to the fissure of Sylvius; by so doing we shall find that the functions represented range in order from the least highly evolved to the most highly specialized—i.e., starting with movements of the abdominal muscles, we end with the centre for speech.

Taking first the marginal convolution, Profs. Horsley and Schäfer have shown that movements of the rectus abdominis of the opposite side only, and also movements of rotation of the trunk to the opposite side, are produced by stimulating the middle of the excitable part of the marginal gyrus. In front of this, movements of the arm are obtained, and, behind it, movements of the lower limb.

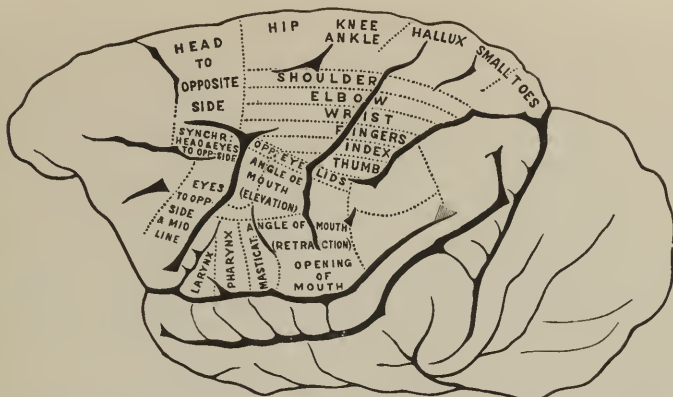


Diagram of the Brain of a Macaque Monkey, showing the areas for the representation of the movements of various parts. (Horsley and Beevor.)

The principal area for the movements of the lower limb is situated in the highest part of the outer surface of the cortex—i.e., the part next to the middle line. This, in the monkey, reaches in front to the vertical level of the præcentral sulcus, and behind to the posterior extremity of the parietal lobule. According to some observations made by the writer, in conjunction with Mr. Horsley, the representation of the different parts of the lower limb can be differentiated (*Phil. Trans. Roy. Soc.*, vol. 179, B, p. 205). The most important of these is the representation of the great toe, which is situated immediately in front and also behind the superior end of the fissure of Rolando—i.e., the end nearest to the middle line. Further, the representation of the hip is in the most anterior part of the area, while that of the smaller toes is behind the fissure of Rolando.

Passing down the fissure of Rolando, we find the area for the representation of the upper limb next to that of the lower limb, occupying the ascending frontal and parietal convolutions as far down as a line drawn across the fissure of Rolando from the lower end of the intra-parietal sulcus to the upper end of the præcentral sulcus. This area corresponds to about the middle two fourths of the fissure of Rolando.

According to Mr. Horsley and the writer, the different segments of the limb are represented in the following order from above downwards—viz., shoulder (nearest to the middle line), elbow, wrist, fingers, index finger, thumb. The thumb can be made to flex alone by stimulation of the cortex in the ascending parietal

convolution just above and in front of the lower end of the intra-parietal sulcus.

Just below the area for the upper limb there is a very narrow strip running across the fissure of Rolando between the præcentral and the intra-parietal sulci, stimulation of which was found by Mr. Horsley and the writer to produce closing of the lids of the opposite eye.

The rest of the ascending frontal and parietal convolutions between the area last described and the fissure of Sylvius is occupied by the areas for the representation of the buccal cavity and the throat.

Thus, in the upper half of this region we have elevation of the angle of the mouth of the opposite side, and below this retraction of the angle of the mouth, and in the part of the cortex next to the fissure of Sylvius we have from behind forwards (1) opening of the mouth around the lower end of the fissure of Rolando; (2) movements of mastication and (3) contraction of the vocal cords, which Semon and Horsley found to be bilaterally represented in the cortex of each side (*Phil. Trans. Roy. Soc.*, vol. 178, B, p. 153). This last area—i.e., for the larynx—brings us close to what is known as the speech centre, situated in man in the posterior part of the left third frontal convolution, destruction of which by hæmorrhage or softening is followed by aphasia.

Besides the areas mentioned above, there is another situated in front of the præcentral sulcus, and occupying the posterior part of the frontal lobe just in front of the ascending frontal convolution. This is for the representa-

tion of the movement of turning the head and eyes to the opposite side, and is the most extensive of all, as it reaches from the median line, above, almost to the fissure of Sylvius, below. Its large extent is perhaps due to the fact that all purposive movements of the limbs are preceded by turning the head and eyes in the direction of the desired movement. The middle of this area—i.e., the part in the hollow of the præcentral sulcus—is for the representation of the simultaneous action of turning the head and eyes to the opposite side, while nearer to the middle line the head tends to move alone, and below, nearer to the fissure of Sylvius, the eyes move without the head.

As already stated, the above account is a description of the results obtained on stimulation of the brain of the Macaque monkey, taking the primary movement—i.e., the first movement obtained on stimulating a given point—as representing the dominant function of the part. By stimulating the excitable cortex of an Orang, Mr. Horsley and the writer obtained results (not yet published) which prove that the primary movements observed in the Macaque correspond very nearly with the single movements obtained in the case of the Orang, these latter being probably very nearly the same as in man.

(b) *The area for the representation of sensory impressions* is considered by Dr. Ferrier to be in the hippocampal convolution, while Profs. Horsley and Schäfer have found that the gyrus fornicatus, which is the continuation of this convolution forwards along the mesial surface, is also part of the area for the representation of anæsthesia. At present, however, no differentiation has been made out for the different parts of the body.

Besides definite anæsthesia, Mr. Horsley has noticed, in cases of lesion of the so-called motor area, a form of perverted sensation, in which an impression is always referred—say, in the hand—to a phalanx higher up than the one touched, and the person complains of subjective numbness, and there is loss or impairment of muscular sense.

(c) *The special senses*, as sight, hearing, taste, and smell, have been localized in the cortex. *Sight* is represented in the occipital lobe, and also in the contiguous angular gyrus in the parietal lobe. In the occipital region the corresponding half of each retina is represented, so that with a lesion of the left occipital lobe

the left half of each retina would be affected, and consequently the person would be unable to see objects to the right of the middle line—i.e., he would have right hemianopsia. In the angular gyrus Dr. Ferrier considers that the whole field of the opposite eye is represented, and also to a less degree the whole field of the eye of the same side; so that from a lesion of the left angular gyrus there follows extreme concentric diminution of the field of vision of the right eye, and a slight diminution of the left field; this is called "crossed amblyopia."

Hearing has been localized in the first temporo-sphenoidal convolution by Dr. Ferrier, but this has been contested by Mr. Schäfer, so that the question is still *sub judice*.

Smell.—From experiments by Dr. Ferrier, and from the facts of comparative anatomy, this sense has been localized in the inner surface of the tip of the temporo-sphenoidal lobe, but, unlike the other special senses, the olfactory centre receives impressions from the nostril of the same side, not the opposite. Some clinical cases have been recorded bearing out the truth of the above localization. (See a case of epilepsy with olfactory aura, *Med. Soc. Proc.*, vol. xii., by Dr. Hughlings Jackson and the writer.)

The centre for *taste* has not been differentiated from that of smell.

The part of the cortex which is in front of the excitable, so-called motor area, and which lies between this and the anterior extremity of the frontal lobe, is considered to have no motor function, but is thought to be the seat of the highest mental processes. Lesions in this part do not produce paralysis, but symptoms of mental dulness or melancholia.

2. *The corona radiata and internal capsule* are made up of the fibres which pass down from the cortex to form the pyramidal tract in the pons and medulla. How many of these fibres end in the basal ganglia (corpus striatum and optic thalamus) is not known, but it is certain that a large number of the fibres pass directly from the so-called motor cortex to the pyramidal tract without any connection with the basal ganglia.

The internal capsule consists of an anterior and posterior limb joined at an angle. The anterior limb is for the most part inexcitable, but the greater part of the posterior limb (commonly described as the anterior two-thirds, but on the average it is more than this) is excitable, the fibres being arranged in the following

order. Beginning in front we have—(1) opening of the eyes; (2) turning of the eyes to the opposite side; (3) turning of the head to the opposite side; (4) opening of the mouth; (5) movements of the tongue; (6) elevation of the opposite angle of the mouth; (7) movements of the upper limb; (8) movements of the rectus abdominis and other trunk muscles of the opposite side; and (9) movements of the lower limb. (For detailed account, see paper in *Phil. Trans. Roy. Soc.* by Mr. Horsley and the writer.)

The fibres of the extreme posterior part, commonly called the posterior third of the hinder limb of the internal capsule, are considered to be sensory, and a lesion there produces not only hemi-anæsthesia of the opposite half of the body, but also affects the opposite special senses as well.

The exact functions of the different fibres of the *corona radiata* have not been accurately worked out—in fact, it is almost impossible to do so by stimulation—but they are probably intermediate between the positions for the representation in the cortex and in the internal capsule. The great point of difference between the symptoms resulting from lesions, such as tumours, in the cortex and in the corona radiata is that local convulsions are not produced unless the cortex itself be involved, whilst lesions of the corona radiata are characterized by a slowly progressive hemiplegia. The hemiplegia which results from similar lesions in the cortex is of yet slower development.

Cerebellum.—Lesions of the anterior part of the middle lobe produce in certain animals, according to Ferrier, a tendency to fall forwards in walking, whilst injuries to the posterior part of this lobe cause the animal to fall backwards. When the lateral lobe is injured or its middle peduncle divided, the animal has persistent movements of spinning round on its vertical axis, the movement occurring in a direction which, in the case of man, with division of the left middle peduncle, would produce rotation on the vertical axis from left to right. If the lesion of the left lateral lobe and left middle peduncle be slight, the animal falls towards the opposite side—i.e., the right. On the other hand, according to Nothnagel, with whom Gowers agrees, there are no symptoms of loss of equilibrium produced by lesion of the hemispheres unless the middle lobe be involved, and, according to the same observers a lesion of the lateral lobes

alone does not produce loss of function of the cerebellum. Lesions of the cerebellum do not in themselves cause any paralysis unless pressure be exerted on the pyramidal tracts in the pons or medulla. Tetanic fits with opisthotonos have been described especially by Dr. Hughlings Jackson, but it is uncertain whether they result from disordered function of the cerebellum or from pressure on the pyramidal tract.

C. E. BEEVOR.

BRAIN, TUMOURS OF THE (Cerebral Tumours).—The symptoms resulting from the presence of a tumour within the cranium may be divided into general, and special or localizing.

The general symptoms are three—viz., headache, double optic neuritis, and vomiting. They serve to indicate that there is an intra-cranial growth, but give no clue to its exact position.

Headache is usually very severe and continuous; it may be either general or, if the disease be situated upon the surface of the brain, localized to one spot, in which case there may also be some tenderness on percussion.

Double optic neuritis may occur without impairment of vision (Hughlings Jackson), and is probably due either to extension of tissue irritation along the optic tract or to meningitis. The rapidity with which the neuritis passes into atrophy is an indication of the progress of the growth.

Vomiting often occurs daily; it is not preceded by nausea, and is of purposeless character, being without relation to the condition of the stomach. This symptom is most frequently present with growths situated in the medulla and cerebellum.

The special symptoms are those which enable us to localize the growth more exactly.

Tumours in the so-called *motor area of the cortex*, grouped around the fissure of Rolando and in the membranes overlying these parts, give rise to localized Jacksonian fits (epileptiform seizures), which begin with tonic spasm of the parts affected by the growth—i.e., with movements of the face, arm, or leg, or with turning of the head and eyes to one side. There may be considerable intervals between the course of the fits, or several may occur in a single day. They are usually unattended by loss of consciousness, and may be followed by paralysis of the part of the body convulsed.

Growths in the *prefrontal region* in front of the motor area do not cause paralysis

directly; they may give rise to general epileptic fits, and are attended by mental symptoms, such as melancholia and failure of mental powers.

Hemianopsia is a symptom of tumours situated in one *occipital lobe*, whether involving the grey matter or the central white fibres. If the lesion be of the *left lobe*, the patient is unable to see objects to the *right* of the middle line, and *vice versa*. Tumours in the *central white matter* of the hemisphere below, but not involving the motor cortex are characterized by a slow hemiplegia lasting over several weeks, but without Jacksonian fits. The paralysis is due to the fibres of the corona radiata being progressively involved, but there is no anæsthesia unless the growth extend backwards behind the motor area.

Lesions of the *internal capsule and basal ganglia* are difficult to distinguish from disease of the corona radiata, as they have many points in common. The group of symptoms which would lead one to diagnose a growth involving the internal capsule is a hemiplegia rapidly affecting the different parts of the body, with hemi-anæsthesia and hemiopia. The latter symptoms are more likely to occur than when the lesion is in the centrum ovale, owing to the hinder part of the internal capsule being involved.

Tumours growing at the *base of the brain* are usually accompanied by paralysis of one or more of the cranial nerves. If situated in the *anterior fossa*, the optic nerve or its chiasma may be involved, producing unilateral loss of sight or temporal hemianopsia. If in the *middle fossa*, the fifth nerve is especially likely to be affected; whilst tumours in the *posterior fossa* often involve the sixth nerve, causing paralysis of the external rectus only, or the facial and auditory nerves. When there is pressure on the spinal accessory and hypoglossal nerves, half of the tongue and palate, and the vocal chord of the same side, are paralysed.

Growths in the *crura cerebri* produce hemiplegia of the opposite side, with paralysis of the third nerve on the same side; and tumours in the *substance of one half of the medulla and pons* cause complete facial paralysis of the same side, conjugate deviation of the eyes to the opposite side (owing to the nucleus of the sixth nerve being affected), and hemiplegia of the opposite side.

In tumours of the *cerebellum*, involving the middle lobe, a characteristic symptom is a reeling gait, and in some cases

nystagmus. Paralysis of the limbs is produced if there be pressure on the pyramidal tracts; tetanoid convulsions are also met with in cerebellar tumours.

The *diagnosis* has to be made from meningitis, hysteria, albuminuria with uræmia, and from lead poisoning; but by a careful consideration of the symptoms given above a diagnosis can usually be made.

The *prognosis* as a rule is exceedingly grave, the most favourable cases being those in which the tumour is either tubercular or syphilitic, as such growths sometimes become arrested. The latter are most amenable to treatment. The recent progress of cerebral surgery has rendered the prognosis more favourable than formerly. The duration of life in cases in which the tumour, either, is not, or cannot be, removed by operation varies from six months to two years (Gowers).

Ætiology.—With regard to *sex*, tumours of the brain are met with twice as often in males as in females, and are more common in childhood and young adult life than in advanced age.

Character.—According to an analysis of cases collected by Ladame and Bernhardt (quoted by Gowers), the tubercular variety is the most common; then come the gliomata and sarcomata; but in the fifty-four cases recently shown at the Pathological Society, sarcomata were the most numerous, gliomata and tubercular growths standing second and third in order of frequency. In addition to the above, psammomata, gummata, carcinomata, fibroids, simple and hydatid cysts, and cysticercus are also met with.

Situation.—The most frequent sites of tumours are as follows, arranged in order of frequency:—Cortex cerebri and subjacent white matter, pons and crura, cerebellum, basal ganglia and ventricles, cerebral envelopes, cranial nerves.

Of the different forms of tumour it may be said that the *tubercular* grow in the lymphatic sheaths, and are most frequent in the cortex.

Gliomata occur in the cerebral and cerebellar hemispheres; less often in the basal ganglia and pons.

Syphilomata grow from the pia mater along the peri-vascular sheaths, and are met with in the cerebral cortex and pons.

Sarcomata grow from the membranes, from bone, or in the brain substance, and very frequently also in the basal ganglia.

Carcinomata are more commonly met with in the basal ganglia.

Parasitic growths occur in the white substance or in the ventricles of the cerebrum.

Gliomata and carcinomata are infiltrating, tubercular and syphilitic growths, and the sarcomata are not.

Gliomata are single, while tubercular and syphilitic tumours and sarcomata are often multiple.

Treatment.—In tubercular cases tonics and cod-liver oil are indicated, whilst in syphilitic cases a course of mercury and iodide of potassium should be thoroughly carried out. Where a diagnosis can be made of cortical, or even sub-cortical, growths, a surgical operation should be advised. Owing to the labours of McEwen and Horsley, the removal of cerebral tumours has been brought within the domain of surgery, and many successful cases have been recorded. After a course of treatment has proved unavailing, an operation should certainly be recommended if the growth can be localized; and even in the case of tumours deeply seated in the cerebrum or cerebellum it is sometimes advisable to make an opening in the skull to relieve the pressure and the agonizing headache, even if the growth cannot be removed. Morphine, Indian hemp, chloral, and ice to the head are the chief remedies for relieving pain.

C. E. BEEVOR.

BRIGHT'S DISEASE.—The term Bright's Disease includes several different organic affections of the kidneys, which in this article are classified thus:—

- | | |
|---------|---|
| Acute | Acute parenchymatous nephritis. |
| Chronic | Chronic parenchymatous nephritis. |
| | Granular contraction of the kidneys. |
| | Albuminoid degeneration of the kidneys. |

The descriptions of these diseases follow in the above order.

Acute Bright's Disease (Acute Parenchymatous Nephritis).—*Symptoms.*—The affection generally begins suddenly with chilliness or rigors, vomiting, headache, and pain in the back; soon the temperature rises slightly, and œdema appears in the face and other parts of the body. When occurring as a sequel of scarlet fever, the symptoms are more insidious in their onset, and the first sign of the renal affection may be swelling of the face coming on about the

third week after the commencement of the primary fever.

When the symptoms of the nephritis are fully developed, the *skin* is dry and pale, the subcutaneous tissues are swollen and œdematous in all parts of the body, but the change is most apparent in the face. A characteristic appearance is produced by the pale and swollen eyelids and cheeks. The *pulse* is increased in frequency, and is of markedly high tension.

The *urine* is voided frequently, but is scanty in quantity, and may, indeed, be for a time entirely suppressed. It is of a dark smoky hue, and gives a copious brownish deposit on standing. Its specific gravity is increased in inverse proportion to the quantity passed. The reaction is usually acid. The urine invariably contains a large amount of albumen. Blood can in almost all cases be detected by the guaiacum-ether test. In nearly all cases red corpuscles may also be found when the urine is examined under the microscope. A condition has, however, been observed in which only the blood-colouring matter was present (hæmoglobinuria); this replaces for a time a true hæmaturia. The urinary deposit consists of casts of the renal tubes; epithelium from the kidney, renal pelvis, and the bladder, with the free nuclei of the epithelial cells. Blood-corpuscles of both varieties, and a granular organic débris mixed with a quantity of amorphous urates, are also present. The tubercasts vary in size, and consist usually of the hyaline, epithelial, and blood varieties. Occasionally granular casts may also be seen. The epithelial cells and blood-corpuscles undergo considerable alterations from their prolonged soaking in the urine, becoming at last broken up and disintegrated. The quantity of urea excreted daily is always diminished, and the total amount of the natural solid constituents of the urine is generally lessened. The patient complains of heaviness and an aching pain in the loins, and tenderness is experienced when pressure is applied over the lumbar region either in front or behind. Sometimes also a fullness can be felt here due to enlargement of the kidney.

The *heart* may, at an early period, show some enlargement from dilatation of its cavities, and, even before the acute symptoms have entirely passed away, may, in rare cases, give some signs of true hypertrophy. A blowing systolic murmur at the apex of the heart may accompany dilatation of the ventricles.

As the disease progresses, the *blood* becomes poorer in quality and loaded with matters which ought to be eliminated by the kidneys. The mucous membranes, as well as the general surface of the body, therefore become anæmic. Respiration is hurried, and, at the bases of the lungs, some impairment of percussion resonance, with bubbling and crackling râles indicate congestion and œdema of these organs. The pleuræ and peritoneum may give signs of a moderate amount of serous effusion. The temperature is somewhat raised, but presents no typical curve. The tongue is dry and coated, the bowels confined, the appetite is lost, and there is great thirst.

Such are the ordinary symptoms of the disorder. They are prone to present themselves in diverse combinations, now one symptom, and now another, being the most prominent. The anasarca especially varies in its situation and amount from time to time. The predominance of the dropsy in certain parts occasionally gives rise to alarming symptoms. The lungs may be waterlogged by œdema: the pleuræ and peritoneum may be so filled with serous fluid that dangerous pressure is exerted upon the surrounding organs; the legs may be excessively swollen, may inflame, and even become gangrenous; the loose tissue about the glottis may swell from œdema and threaten asphyxia. Further dangers impend from the gradual accumulation of excrementitious matters in the blood by reason of the inaction of the kidneys. Convulsions, coma, severe headache, and vomiting may be thus produced, and constitute very serious complications. They will be more fully discussed in the article on URÆMIA. Inflammation of the lungs and of the pleuræ, pericardium, and peritoneum are prone to arise. Certain eye phenomena are met with. Frequently the retina is lazy, apparently from œdema; flame-shaped hæmorrhages are not uncommon, and occasionally signs of inflammation of the optic papilla are apparent.

That form of the disorder in which the glomeruli of the kidney are specially affected (glomerulo-nephritis: *see below*) is characterized by the presence of excessive dropsy and by the early occurrence of uræmic phenomena.

Course.—The disease may end in recovery or in death, or may lapse into chronic Bright's disease.

The course towards recovery is inaugurated by a decline of the pyrexia, a much freer discharge of urine and a

diminution of the amount of blood therein contained. The urine becomes of lower specific gravity; the albumen and tube-casts diminish in amount and finally disappear, the small hyaline casts being the most persistent. The œdema of various parts is gradually removed, the dryness of skin becomes less apparent, the pulse resumes its normal tension, and, after a period of more or less protracted convalescence, not infrequently interrupted by one or more recrudescences of the disorder, the normal state is attained.

Death may be caused by any of the untoward conditions mentioned above. Further, cardiac failure is frequent, for the heart may not have sufficient reserve power to overcome the increased arterial tension. In such a case the pulse assumes the characters of "virtual tension" (*see PULSE*), and the feeble heart dilates to a dangerous extent. Finally, the albumen may never entirely disappear from the urine, the dropsy of the integuments and internal parts may remain in diminished amount, the pulse may retain its characters of high tension, and gradually the case assumes the appearance of one or other of the forms of chronic Bright's disease.

Diagnosis.—The recognition of the disease is nearly always easy; it may, however, be difficult to determine whether an acute attack is merely a complication of the chronic disease, as is very often the case, or whether it has been primary in its onset. The absence of similar symptoms at any preceding time, of any hypertrophy of the heart at an early stage of the affection, of fatty elements in the urinary deposit, and of the white patches in the retina, generally called albuminuric retinitis, are all in favour of the disease being primarily acute. If, in addition to the above negative signs, the affection occur in a young person, or after a drinking bout, or as a sequel to one of the specific fevers, the probability that the attack is primary is much increased.

Morbid Anatomy and Pathology.—The organic lesion in this disorder is always an acute inflammation of the kidneys. The kidneys are enlarged, and, on section, the cortex is seen to be disproportionately increased in extent. The medullary portion is of a bright-red colour, showing a longitudinal striation of deep-red lines, some of which are prolonged into the cortex from the bases of the pyramids. The cortex is either red or yellowish-white in colour, or shows a mottling of the two colours. On the cut surface

of the red kidney the Malpighian bodies are seen as red points, and spots of hæmorrhage are here and there apparent, while a bloody fluid exudes abundantly. In the pale kidney the glomeruli are not so easily seen, and may be entirely invisible to the naked eye. In the cases to be described below of glomerulonephritis, the glomeruli often appear as white glistening points on the generally pale surface. In all cases the capsule of the kidney peels off easily, and leaves on removal a smooth surface, on which the congested stellate veins are more than usually prominent.

On *microscopic examination* the changes are chiefly found in the cortical portion of the kidney, and especially in the convoluted tubes, although all parts of the organ are more or less affected. The convoluted tubes are greatly increased in diameter, their cells are swollen, and so amalgamated as to present an almost continuous mass of protoplasm, not easily separated into its cellular elements even at the free margin. The bodies of the cells are no longer striated, but are very granular, and contain large hyaline globules, and sometimes droplets of fat. The nuclei of the cells may be entirely hidden by the swollen protoplasm, and, when seen, are often greatly increased in number. In severe cases the cells exhibit the changes of the so-called "coagulative necrosis." The lumen of the tubule may be entirely obliterated by the swollen epithelial cells; or, again, it may be occupied by a quantity of granular débris, mixed with detached cells, leucocytes, hyaline globules, red blood-corpuscles, and a fibrinous exudation which in the lower tubes forms casts of the lumen. In the later stages, the protoplasm of the cells breaks up into a mass of granules and fat drops, and is to a great extent carried away along the tube. The blood-vessels are engorged, and in the very acute stages numerous hæmorrhages may be seen in and around the tubules.

The colour of the kidney depends upon the relative preponderance of the congestion or of the epithelial change, the enlarged blood-vessels giving the red colour, which is afterwards hidden by the proliferated and swollen epithelial cells. Between the tubules, and especially around the glomeruli, numbers of leucocytes may be seen, but this interstitial infiltration is rarely a marked feature of the disorder. The glomeruli show extreme congestion, and there is often a hæmorrhagic exudation into the interior of Bowman's

capsule, while the small afferent and efferent arteries are occasionally seen to have undergone hyaline degeneration.

In certain cases the glomeruli are the seat of more pronounced changes, to which condition the term "**glomerulonephritis**" has been given. The changes observed are various, and may briefly be described as follows:—There may be proliferation of the cells lining Bowman's capsule (capsular epithelium), or of the cells covering the glomerular tuft (glomerular epithelium), or of the few connective-tissue cells which bind the glomerular loops together. Also there have been observed proliferation of the nuclei of the small capillary vessels of the tuft, and thrombosis of these vessels; while, again, leucocytes, which had clearly exuded from the vessels, have been found between the loops and in the cavity of the capsule. The result of these changes is that the circulation of blood through the glomerulus is greatly interfered with, and consequently its functional activity hindered. Probably the glomerular inflammation is never found without changes in the renal tubes. Of late a few workers have attempted, but unsuccessfully, to show that a glomerular change invariably precedes that of the tubules. Finally, it must be stated that, in certain cases, collections of micrococci have been found in the vessels of the kidney and in and between the tubules.

Ætiology.—Acute Bright's disease is most frequently caused by exposure to cold. It is a common complication of some of the specific fevers, especially scarlet fever, and more rarely of measles, erysipelas, and small-pox. It may also be produced by an overdose of turpentine or cantharides. An alcoholic debauch is not infrequently followed by an attack of acute nephritis. The existence of chronic Bright's disease, or of puerperal albuminuria, or, in the opinion of the writer, of so-called functional albuminuria acts as a predisposing cause for an attack of the acute disorder. In such conditions any of the causes above named, but especially exposure to cold, is the more liable to produce an attack of acute nephritis.

Prognosis.—The prognosis is not so favourable in the young as in those advanced in life. The symptoms of evil augury have been mostly detailed above in describing the complications. The presence of any of these greatly increase the danger of the patient. The condition of the circulatory system is of

great importance. The presence of a considerable degree of dilatation of the heart, indicating failure of the heart-muscle to overcome the increased arterial tension, is a most serious condition. On the other hand, an even more unfavourable sign is the entire absence of an increased tension in the pulse throughout the attack, a condition which sometimes occurs in weakly subjects. The persistence of albuminuria or of anasarca when the other acute symptoms have disappeared is indicative of a probable lapse into the elhronic condition. Nevertheless, a patient may entirely recover after a long convalescence, and when repeated recrudescences of the disease have occurred.

Treatment.—Dr. Mahomed showed that an attack of acute nephritis during the course of recovery from scarlet fever may be averted by proper treatment. High arterial tension and the presence of a small amount of blood-colouring matter in the urine precede the appearance of albumen, and are in turn caused by constipation. A free purgation will remove both these conditions and prevent the onset of renal changes.

At the commencement of an attack of acute Bright's disease the patient should be placed in bed and wrapped in blankets. A hot poultice should be applied to the loins, and renewed as often as it becomes cooled. Dry cupping to the loins is also of value, but it is not advisable to apply the scarificator unless the patient be of a robust frame. The food must be entirely fluid, and contain as little nitrogenous matter as possible. Milk, beef-tea, chicken-broth, barley-water, arrowroot, and such-like articles should form the staple of the dietary. Diluents, such as lemonade, should be given freely, and distilled water (best in the effervescent form, as Salutaris water) should be taken in large quantities in order to wash out the accumulated epithelial debris from the kidneys.

As internal remedies the citrate and acetate of potassium in dilute solution and the liquor ammonii acetatis with a little tinct. hyoscyam. are of great use in allaying the febrile symptoms and promoting the action of the skin. For the same purpose the tartrate of antimony may be given in the form of the wine or the powder, but the alkaline remedies are preferable in all but very robust patients. A hot-air or vapour bath, or the "blanket bath," should be employed every evening. The bowels must be kept freely open by a purge every day or other day.

For this purpose the saline purges and the compound jalap powder are the most advisable.

It is considered dangerous to use mercurial purges on account of the ease with which such patients are salivated. Nevertheless, no drug is so efficacious as calomel in reducing high arterial tension, and the writer does not fear to use it even in acute Bright's disease when the pulse indicates the existence of an excessively high tension. At the commencement of the case 2 grains of calomel with 2 grains of extract of colocynth may be prescribed, followed in a few hours by a saline purge. The further purgation should then be kept up by other remedies, using the calomel again only when the arterial tension becomes excessively high.

Vomiting is best relieved by the sucking of ice, by effervescent drinks, or, if severe, by creosote or carbolic acid internally. Blood-letting is of value when uræmic symptoms present themselves, but for further details the article on URÆMIA may be consulted.

As the more acute symptoms subside, iron preparations should be cautiously given. The tinct. ferri acetatis combined with pot. acetatis is a preparation easily borne, and the alkalies can be stopped as the renal secretion becomes again established and no ill effects are observed from the use of the iron. Dropsy may be combated by (in addition to the remedies already mentioned) digitalis and scoparium. Secondary inflammation of the lungs or of the serous membranes should be treated by mustard poultices and other hot applications, but turpentine and cantharides are to be avoided on account of their irritant action on the kidneys when absorbed. Cardiac dilatation calls for cardiac tonics, such as digitalis, strophanthus, and strychnine; and the dangerous condition mentioned above where the pulse tension is throughout low is best combated by the free use of dilute nitro-hydrochloric acid and strychnine and the early administration of iron.

Chronic Bright's Disease.—Under this heading are commonly grouped three chronic diseases of the kidneys—chronic parenchymatous nephritis, granular contraction of the kidneys, and albuminoid degeneration of the kidneys.

Chronic parenchymatous nephritis is also known as chronic tubal and chronic desquamative nephritis, and the kidney resulting from the discase is often called the large white kidney.

Granular contraction of the kidneys is also known as chronic interstitial nephritis and its result spoken of variously as the small red granular kidney, the red contracted kidney, and sometimes as the gouty kidney or the arterio-sclerotic kidney.

Albuminoid degeneration of the kidneys is also known as the amyloid, waxy, or lardaceous kidney.

Although the division of chronic Bright's disease into three varieties is convenient for purposes of description, yet it must be mentioned that rarely is a case met with in which the changes peculiar to one variety are present alone. Mixed forms are common, and even the rule. In the large white kidney the interstitial tissue is very frequently thickened, in the small red kidney the cells are often in a state resembling that found in parenchymatous nephritis, whilst in amyloid degeneration the kidney is often puckered by the excess of contracting fibrous tissue.

The symptoms and diagnosis of the various forms will be described together, and the morbid anatomy and pathology of each variety will then be treated separately.

SYMPTOMS.—Chronic Bright's disease is sometimes the consequence of an attack of acute nephritis, and the mode of progression from the acute to the chronic condition has already been described. In the majority of cases, however, the onset of the disease is gradual and insidious, and it is not detected until it has been in existence for some time. Sometimes attention is called to the state of the patient by the supervention of symptoms of acute Bright's disease, when it is discovered, on careful inquiry and observation, that the chronic disorder has been previously in existence. Often a little puffiness of the eyelids or of the ankles, breathlessness, dull, throbbing, and persistent headache, disorders of vision, or hebetude and disinclination for customary mental exercises are the first symptoms which cause a suspicion in the mind of the physician that the kidneys are at fault.

The symptoms vary greatly in their grouping and individual intensity according to the form of the disease from which the patient suffers. They may thus be summarized in a general form:—Albuminous urine, depositing tube-casts and renal debris; a pulse of high arterial tension, and hypertrophy of the heart most marked in the left ventricle; frequent micturition, especially at night;

dropsy in various parts of the body; progressive anæmia; dryness of skin; derangements of digestion, and a tendency to the occurrence of uræmic phenomena and of secondary inflammations of the lungs and serous membranes. Some of these symptoms require more detailed description.

Urine.—With the large white kidney, when uncomplicated, the urine is always scanty; with the small red granular kidney it is abundant, except in the later stages, when it becomes diminished in quantity; with the amyloid kidney also it is abundant, and this is often the first sign of the supervention of the kidney mischief upon the chronic wasting or suppurative disease which gives rise to it. Partial suppression of urine for a short time is in any of these forms followed by a discharge more copious even than was the previous habit.

The specific gravity of the urine varies inversely as its quantity. It is therefore low in urine from the granular and amyloid kidneys, high in that from the large white kidney. Nevertheless, it may happen that a urine of low specific gravity is small in quantity; this is, naturally, a condition of ill omen. The colour of the urine is generally somewhat lighter than normal. It may be quite clear, or may deposit on standing a cloud composed of crystals, casts, and renal debris. Occasionally it may contain blood, usually only in very small quantity.

The urine always contains albumen at some period of the disease. In the large white and amyloid kidneys the amount of albumen passed is very large. The urine from the granular kidney, until the very late stages, rarely contains a large quantity of albumen. It may, indeed, for long periods not contain albumen in quantity sufficient to be detected by the ordinary methods. It is to be noted that the albuminuria is influenced by the normal physiological processes, is more pronounced after meals and after exercise, and, moreover, is prone to be more marked in the forenoon than at other times. In doubtful cases, therefore, it is desirable to examine the urine passed shortly after breakfast and exercise, and not to pronounce upon the absence of albumen until several consecutive specimens have been tested.

In the granular kidney a temporary failure of the heart power, which is not an unusual phenomenon, will cause a considerable increase of the albuminuria, lasting only until the heart again recovers strength. In the later stages the

albumen is, even in the case of the granular kidney, abundant, from a combination of weak circulatory power and degenerative changes in the epithelial structures of the kidney.

The reaction of the urine is generally acid, but it may vary. In the deposit from the urine are found casts of the renal tubes, renal epithelium, granular and fatty matter, and occasionally crystals of uric acid and oxalate of lime. The tube-casts are most plentiful in the large white kidney, but are never so numerous as in the acute forms of nephritis. Epithelial and blood casts are rarely met with in chronic Bright's disease. The prevailing casts are the granular, fatty, and hyaline, the last form being often the only one met with in the urine from the albuminoid kidney. The renal epithelium found in the urine may show extreme degenerative changes.

The excretion of the solids of the urine is diminished. The urea, it is to be specially noted, is excreted in greatly diminished quantity.

Intercurrent pyrexia impresses its own peculiar characters upon the urine. Whatever may have been its previous condition, during the pyrexia the urine becomes scanty, of high colour, and more albuminous; it deposits urates on standing, and the excretion of urea is increased.

Circulatory System.—The characteristic pulse of chronic Bright's disease is one of high arterial tension, the features of which will be found described in the article on PULSE. The tension is highest in cases of the granular kidney, is well marked in cases of large white kidney, but when there is pure albuminoid degeneration of the kidney the arterial tension is low. The latter condition is, however, rarely met with. As already mentioned, the albuminoid kidney is most frequently combined with the granular degeneration, and this combination affects the character of the pulse, which is rendered of higher tension than it would otherwise be. In the course of chronic Bright's disease the heart is prone to become weak, sometimes for a short period only, sometimes as the precursor of the end. Under such conditions the pulse becomes one of "virtual tension" (see PULSE), indicating peripheral resistance in the circulation, not overcome by the cardiac systole.

In chronic Bright's disease the heart is enlarged proportionately to the increase of the arterial tension. Thus the enlargement is greatest, and present with

the greatest frequency, in the granular kidney; is least, and is often absent, in the albuminoid kidney. Primarily, at least, this enlargement takes the form of hypertrophy, affecting more especially the left ventricle. The special signs in this condition are, displacement of the cardiac apex downwards and to the left, extension of the deep cardiac dulness in the same direction, a heaving impulse, and a loud, prolonged and booming first sound. At the same time the coincident high arterial tension causes a reduplication of the first sound at the apex, and an accentuation of the second sound at the aortic cartilage. In the later stages, and more frequently in association with the large white kidney than with other forms, the hypertrophy of the heart becomes combined with dilatation of its cavities, the heart muscle becoming weakened, and giving way before the peripheric resistance. The apex impulse is then found to be more diffused and less forcible, the first sound short and sharp, and not infrequently accompanied or followed by a blowing systolic murmur. The existence of chronic Bright's disease furthers the production of atheroma in the arteries and of analogous changes in the valves of the heart. This may give rise to valvular incompetence varying in its symptoms and signs with the valve affected. There is another association of kidney mischief with heart disease, which must not be overlooked, although it does not properly belong to this section—viz., the hardening of the kidney from chronic congestion, secondary to a lesion of the heart. The signs of the kidney mischief in such a case are generally but slight, and occur some time after the cardiac phenomena have been evident.

In the course of chronic Bright's disease the blood undergoes progressive changes. The clinical evidences of these are anæmia of the skin and mucous membranes, dropsical effusions in different parts, and various symptoms which may arise from the action of the impure blood on the nervous system. The actual changes in the blood consist of a diminution in number of the red corpuscles, and an increase of the water, together with a decrease of the amount of albumen, and the accumulation in the blood of urea, uric acid, and extractive matters.

The exact relation between hypertrophy of the heart and kidney disease has been greatly discussed, and diverse views are still held. They can only be briefly summarized here. Bright believed

that the blood, altered in quality by reason of the disease of the kidneys, acted as an irritant to the muscular tissue of the heart, stimulating it to increased work and consequent hypertrophy. But he also suggested that the impure blood did not circulate easily through the capillaries, and that the resistance to its passage called forth the exercise of greater force on the part of the heart, requiring in turn an increase in the amount of muscular fibre. The view that a resistance to the circulation is situated in the capillaries, and that this causes increased arterial tension and so gives rise to hypertrophy of the heart has been supported in more recent years by Dr. Galabin and Dr. Broadbent. After some hesitation the writer is now of opinion that this explanation is most in accordance with the clinical and pathological facts. It has been mentioned above that the blood-flow through the granular kidney is obstructed, and Traube based his view of the relationship under discussion upon this fact. The obstruction causes a diminished quantity of blood to flow through the kidneys in a given time, and consequently the remainder of the arterial system is distended. Moreover, a less quantity of fluid is withdrawn from the blood in the form of the watery constituents of the urine. Both these factors, said Traube, combine to increase the general arterial tension, and so cause hypertrophy of the heart. Bamberger, again, adopted the latter portion of Traube's view. Dr. George Johnson showed that the muscular coat of the arteries throughout the body was hypertrophied. This, he believes, is due to a resistance offered by them to the passage of impure blood to the tissues—a "stop-cock action." The resistance increases the arterial tension, which in turn calls forth the cardiac hypertrophy. Sir Wm. Gull and Dr. Sutton described a further change widely spread throughout the arterial system. This is a deposit of a "hyalin-fibroid" material in the adventitia of the vessels. They believe this to be a primary lesion. It may begin in the kidneys, when it produces the lesions of the so-called "granular kidney," but it may also commence in other parts. The presence of the hyalin-fibroid material in the vessel hinders the flow of blood, increases the arterial tension, and so causes the hypertrophy of the heart. These are the main opinions which have been put forth; there are also numerous minor ones, but it would be inconsistent with the nature

of this work to discuss the matter further.

Cutaneous System.—The skin is dry and harsh, and rarely perspires. It is pale in cases of the large white and amyloid kidneys, sallow in those of the granular kidney. Dropsy of the integuments is very variable in its appearance. In the granular kidney it is the least marked, and may be entirely absent from first to last. In the large white kidney it is most constant, and is often extreme in amount. It is variable also in its duration and seat. It may be widely diffused over the whole body, or limited to the eyelids, the front of the tibiae, and the ankles, or to the genitals. A most characteristic localization of renal dropsy is in the loose tissues immediately below the eyelids, and yet œdema is just as commonly found near the ankles, or on the dorsum of the foot, the seats of election for early cardiac dropsy. Many such cases are really of cardiac origin, and due to the failure of nutrition of the heart fibres.

Eruptions may be met with on the skin. The chief of these are eczematous and erysipelatous inflammations, purpuric spots, and pemphigus.

The **digestive organs** are prone to be disordered. The appetite is poor, and various dyspeptic troubles are complained of. The bowels are, as a rule, constipated, the liver may be somewhat enlarged, and, when dropsy is well marked in other parts of the body, ascites is also present.

Cough and bronchitis are of common occurrence.

The **retina** shows a variety of changes. The most marked lesions are flame-shaped hæmorrhages, and white glistening spots, most numerous near the macula lutea, frequently arranged in lines like the radiations from a star. The latter constitute a most characteristic appearance, from which alone the nature of the disease may be diagnosed. The following changes are also met with:—Optic papillitis, general diffused retinitis, œdema of the retina, and atrophic spots, the remains of old hæmorrhages.

The **nervous symptoms** of Bright's disease are mostly of uremic nature and will be briefly reviewed below. It may be mentioned here that, of late, attention has been called to numbness and pallor of the fingers (*doigt mort*), as an early sign of Bright's disease. The writer doubts if this sign is of any value. Pains of different kinds are frequently complained of. Pain in the lumbar region is

clearly associated with the more deeply situated disease of the kidneys, and tenderness on pressure in the same part is often observed. But neuralgic pains also, affecting the region of distribution of the sciatic nerve as well as other parts, are sometimes obstinately persistent.

COMPLICATIONS.—Many of these have been mentioned in describing the symptoms. Inflammations of the serous membranes—pleurisy, pericarditis, peritonitis—and pneumonia are amongst the most formidable of the complications of chronic Bright's disease. The arteries strained by the high tension not infrequently rupture and give rise to hæmorrhages. The bleeding may take place from the nose, or from the lungs, causing hæmoptysis, or even from the kidneys themselves, the blood appearing in the urine. In these situations the bleeding is rarely dangerous, albeit, occasionally, the pulmonary hæmorrhage may be so profuse as to disable the lungs, and a patient may in rare instances die from excessive hæmaturia. But the most dangerous hæmorrhages are those from the cerebral arteries. Indeed, granular kidney, with its associated cardio-vascular changes, is the most frequent cause of cerebral hæmorrhage.

Cardiac failure with dilatation is one of the most common complications of Bright's disease. It is accompanied by a diminution in the quantity of urine and an increase in the amount of its contained albumen. The oedema of the tissues increases, or, if not previously present, now appears. In addition, oedema of the lungs, as shown by the presence of crepitation at the pulmonary bases, and dropsy of the pleural sacs, result from the cardiac weakness, and their occurrence interferes greatly with the respiratory functions. The changes observed in the cardiac sounds and in the pulse, when the heart fails, have already been detailed.

Oedema of the larynx in some cases causes dangerous and even fatal asphyxia. Severe vomiting and diarrhoea occur occasionally, not rarely as the result of the impurity of the blood, but they may also arise from ulcerative lesions of the gastro-intestinal tract.

The deficient action of the kidneys causes an accumulation in the blood of excrementitious matters ordinarily eliminated. This condition is known as *uræmia*, and is the cause of a great number of symptoms, which will be fully described in the article devoted to that subject. For convenience they will be

here enumerated. In the nervous system we notice headache, muscular twitches and convulsions, coma, and sometimes a hemiplegia independent of a gross cerebral lesion. Sudden blindness or deafness may come on, and mental derangements may occur, generally assuming the form of melancholia, but sometimes of mania. Vomiting, nausea, and diarrhoea of an uncontrollable character are not unusual. Paroxysms of dyspnoea simulating asthma are among the rarer phenomena, but the breathing in uræmic attacks is very prone to assume the Cheyne-Stokes' character.

DIAGNOSIS.—The question of the diagnosis of chronic Bright's disease arises chiefly under the following circumstances:—

(1) When albuminuria occurs persistently without any other serious derangement of health. The points to be relied upon in determining whether in such a case organic disease of the kidneys is present will be found discussed in the article upon **ALBUMINURIA**.

(2) When cardiac disease and albuminuria co-exist. The albuminuria may in this instance be due to venous engorgement of the kidneys, secondary to the cardiac trouble, or it may be the result of chronic Bright's disease, to which the heart affection is secondary. Venous congestion of the kidneys, however, may generally be detected by observing that the urine is scanty, of high specific gravity, and yet contains, as a rule, only a small quantity of albumen, deposits urates, but very few casts, on standing, and contains very frequently a quantity of bile pigment. Moreover, there may be a history of valvular disease of the heart or of some affection likely to have produced it—*e.g.*, an attack of acute rheumatism—and it may appear that the symptoms of cardiac distress, with cyanosis and enlargement of the liver, were present prior to the occurrence of the albuminuria.

(3) When headache, digestive disturbance, or puffiness of the features, or a copious discharge of urine, create a suspicion of chronic Bright's disease, and yet the urine contains no albumen. Either the granular or the amyloid kidney may be present. The urine of the granular kidney is frequently, and often for considerable periods at a time, free from albumen, but it is persistently of low specific gravity, whilst the pulse is of high arterial tension, the heart is hypertrophied, and urinary tube casts are occasionally detected, although they

may easily be overlooked. Further, the excretion of urea is deficient. If, however, the retinal changes be found, the diagnosis is rendered certain.

Although the urine of the albuminoid kidney ordinarily contains a large amount of albumen, cases at times occur in which it is entirely absent. Indeed, the passage of a large quantity of limpid urine of low specific gravity is an earlier sign than albuminuria of amyloid degeneration in the kidneys. Such a symptom occurring after long-continued suppuration, or in the presence of a wasting disease or a cachectic state, should excite suspicion that this change is in progress. If the liver and spleen be coincidentally enlarged, no difficulty would be experienced in coming to a correct diagnosis.

(4) When an outbreak of apparently uræmic symptoms occurs (*see URÆMIA*).

(5) When the signs of acute Bright's disease are present, or when an attack of pneumonia, pleurisy, &c., is accompanied by albuminuria, and it is desired to ascertain whether chronic Bright's disease preceded.

Here the condition of the heart is all important. Cardiac hypertrophy or considerable dilatation, in the absence of valvular disease, would indicate that high arterial tension had preceded the acute attack. The white spots of retinal degeneration would be positive evidence of chronic Bright's disease. Great anæmia in a middle-aged person, and the occurrence of pneumonia or pleurisy on both sides of the body, are also probable indications that the affection is only a complication of chronic kidney mischief.

The diagnosis of the several varieties of chronic Bright's diseases from one another is to be found above in the discussion of the symptoms. It may be convenient, however, to summarize them here.

(a) In the granular kidney the urine is copious, of low specific gravity, and contains but little albumen. The pulse is of very high tension, and the heart is greatly hypertrophied. There is little dropsy. In the retina there are hæmorrhages and degenerative patches, and there is a tendency to hæmorrhage from various organs. The skin is sallow, and there is some anæmia, but it is not extreme in degree.

(b) In the large white kidney the urine is scanty, of high specific gravity, and contains a large amount of albumen. The pulse is of high tension, and there is hypertrophy of heart, which very often subsequently undergoes dilatation.

There is much dropsy. In the retina there are hæmorrhages, but rarely degenerated patches. There is less tendency to hæmorrhage from other organs, but more to internal inflammation than in the granular kidney. The skin is pale, and there is great anæmia.

(c) In the albuminoid kidney the urine is copious, of low specific gravity, and contains a variable amount of albumen, rarely none, usually a considerable quantity. The pulse is of low tension, there is no tendency to cardiac enlargement. There may or may not be dropsy. There are no retinal changes, and there is no tendency to hæmorrhage, or to internal inflammation. The skin is pale, there is great anæmia, and one of the causes of albuminoid disease enumerated below is to be found.

It must again be mentioned, however, that mixed forms, and therefore mixed symptoms, are the rule.

Morbid Anatomy and Pathology of Chronic Parenchymatous Nephritis.

—*Morbid Anatomy.*—The kidney is large and pale, or its surface may show a mottling of red and yellow patches. The *venæ stellatæ* of the surface vary as regards their prominence. On section the cortical portion is increased in extent and is very pale in colour, the medullary portion may appear to be normal or is congested and streaked with deep red lines. The capsule peels off easily, and leaves a smooth or very slightly granular surface, upon which, as a rule, no cysts are seen.

On microscopic examination the changes which are observed are most marked in the convoluted tubes. The tubules are enlarged and distended with the proliferated and swollen epithelial cells. The lumen of the tubule is sometimes almost invisible, so great is the mass of protoplasm bounding it; or, again, it may be blocked by a fibrinous cast. The protoplasm of the cells is very opaque and granular, and often studded with fat globules, while the outlines of the individual cells cannot be easily distinguished. The nuclei of the cells are often invisible on account of the swelling of the protoplasm. On the other hand, the nuclei are sometimes very evident and much increased in number. The hyaline globules described in acute nephritis, are also found in the protoplasm of the cells in chronic nephritis. The basement-membrane of the tubules is thickened.

The glomeruli often show changes consisting of one or other of the condi-

tions described under the head of glomerulo-nephritis, but proliferation of the capsular epithelium and thickening of the capsule itself by successive concentric layers of fibrous tissue are the changes most commonly met with.

The interstitial tissue is rarely normal. It is usually somewhat thickened, especially between the convoluted tubes, and is sometimes infiltrated with leucocytes. The vessels are at times engorged, and not unfrequently hæmorrhages are seen in and between the tubules.

Such is the typical condition of the large white kidney. But it is prone to undergo other degenerative changes. The protoplasm of the cells in the tubules becomes still more granular or fatty, and occasionally pigmented, and finally breaks down into an amorphous débris, which is carried away in the urine. The tubules then collapse, and as the tubules affected are almost entirely those of the cortical portion of the kidney, the thickness of the cortex becomes greatly diminished. At the same time the interstitial tissue becomes increased in amount, especially between the tubules, but also round the blood-vessels, and the glomeruli become diminished in size.

These appearances characterize what is known as the *small white kidney*. It is a late condition, but not a necessary sequence, of the large white kidney, and transition stages between the two are occasionally met with.

Pathology.—The large white kidney is most frequently the result of an attack of acute nephritis which has lapsed into the chronic condition. It may arise also as a consequence of pregnancy (*see* PUERPERAL ALBUMINURIA), and is common amongst beer-drinkers. The average age of its victims has been found to be 28.2 years.

Morbid Anatomy and Pathology of Granular Contraction of the Kidneys.

—The kidney is almost always much diminished in size and weight. Nevertheless, cases are occasionally met with in which the normal size of the organs is retained or even exceeded. The capsule is greatly thickened, and adherent to the underlying gland tissue. It is sometimes impossible to remove it without tearing away the kidney substance. In other cases, again, the capsule peels off with some little difficulty, and leaves, on removal, a surface the appearance of which gives its name to this form of Bright's disease. The surface is of a general reddish colour, on

which are seen numerous small yellowish elevations or granules of a rounded outline. Frequently, and, indeed, in most cases, numbers of cysts appear between the granulations, varying in size, from that of a pin's head to that of a walnut; some are filled with limpid, others with turbid fluid; and others, again, contain a dark glutinous substance.

The kidney is firm on section, and its cut surface reveals considerable atrophy of the cortical portion of the organ, and more cysts are seen in the renal substance.

When a section of the kidney is examined *microscopically*, the interstitial tissue is found to have undergone very great increase in amount, mostly round the blood-vessels and glomeruli, but also in all other parts. In most cases the fibrous tissue is fully formed, yet occasionally its cellular elements are found in excess.

The tubules of the kidney are greatly reduced in calibre; their cellular elements are more or less atrophied, sometimes being entirely absent, at other times fatty and granular. The irregular bulky epithelium of the convoluted tubes is often represented by a layer of cubical cells much smaller than those from which they originated.

The glomeruli suffer equally with the tubules. They are much smaller than normal by reason of the pressure exerted upon them by the growth of fibrous tissue around, and, to a less extent, on account of the atrophy of the glomerular tuft itself from increase of the interstitial tissue between its capillaries. Often the whole glomerulus is transformed into a fibrous, hyaline, or colloid mass of absolutely no functional utility.

The arteries show a considerable thickening of their walls which may affect all three coats. The adventitia is thickened by a great increase of its fibrous tissue, the middle coat shows a much greater amount of muscular fibre than is normal, and the intima, between the elastic layer and the internal endothelium, is occupied by a fibrous or amorphous material which projects into and occasionally blocks the lumen of the vessel.

In the granular kidney of gouty origin streaks of a yellowish white colour are often seen in the pyramidal portion of the gland, and these, on microscopic examination, are found to be either amorphous, consisting of urate of soda, or they may exceptionally be crystalline, and composed of uric acid.

It has been shown by Dickinson, and

again by Thoma, that such a kidney offers much greater resistance to the injection of its blood-vessels than does a normal kidney.

Pathology.—The process by which this state of kidney is attained has received several explanations. It has been thought that an inflammation starts in the epithelial elements, and that from the atrophy of these the tubes containing them collapse. The fibrous tissue would, according to this view, be the altered remains of the collapsed tubes. Again, the process has been looked upon as from the first interstitial and yet inflammatory—a chronic interstitial nephritis. Finally, the fibrous tissue has been thought to be the result of a degenerative overgrowth, believed by some to be confined to the kidney, by others to be part of a widely spread fibrous overgrowth in all parts of the body, but specially connected with the arteries.

The granular contracted kidney may result from an attack of acute nephritis, but not so frequently as does the last form described. It is specially related to the gouty and syphilitic diatheses. Chronic lead poisoning is a frequent cause, and experimentally the disease has been produced by dosing animals for a considerable time with lead or cantharides. Alcoholic excess, and especially spirit drinking, is believed by most observers to be productive of this form of kidney disease.

The average age of patients suffering from the affection is 50.2 years. It is more common in the male sex, and a hereditary transmission has been occasionally noted. Like the large white kidney, it is sometimes the final stage of the renal disease of pregnancy.

Morbid Anatomy and Pathology of Albuminoid Degeneration of the Kidneys.—The kidney in its typical form is enlarged, and much paler than normal, though mottled on its surface by the red *venæ stellatæ*. It cuts firmly, and the pale, bloodless section shows an increase of the cortex in depth, and has a peculiar, glistening, bacon-like appearance. The glomeruli stand out upon the cut surface as bright, pale points. The medullary portion appears by contrast to be of a brighter red than is usual. The capsule peels off easily, and leaves on removal a smooth surface. The change becomes more evident, and can easily be seen when only slight in amount, if colouring agents are used for which the albuminoid parts have a special affinity. For naked-eye purposes a cut surface of the kidney may

be treated with liquor iodi, which tinges the affected parts of a mahogany-brown colour, the remainder of the kidney taking a yellow tinge. For microscopic examination a solution of methyl-violet is preferable. This colours the albuminoid parts a reddish purple, the others blue. By these reagents the smallest amount of the change can be readily detected.

On *microscopic* examination the parts affected by the albuminoid change appear translucent, glistening, and homogeneous unless coloured by the reagents mentioned. The change is most marked in the glomeruli and the walls of the blood-vessels, but is also found in the interstitial tissue and in the basement membrane of the renal tubes; rarely in the epithelial cells. The tubules are described by Dr. Dickinson as more rigid and widely open than is normal. In certain cases the change is limited to the vessels of the medullary portion of the kidney (*vasa recta*), and leaves the glomeruli intact.

Such is the typical condition of the albuminoid kidney, but very frequently it is combined with an over-growth of interstitial fibrous tissue, which causes its surface to be rough and coarsely granular, resembling that of the red contracted kidney, while its volume, too, may then be diminished instead of increased.

The nature of albuminoid degeneration will be found discussed elsewhere.

Pathology.—This change in the kidneys, as in other parts, is caused by prolonged suppuration, by disease of bones and joints, by tuberculosis, and by the syphilitic, mercurial, or malarial cachexiæ. It is associated sometimes with lead poisoning, gout, rickets, leucocythæmia, Hodgkin's disease, and slowly growing tumours.

PROGNOSIS OF CHRONIC BRIGHT'S DISEASE.—It has been recorded that albuminoid disease of the kidney, if only slight in degree, has been recovered from when the original suppurative affection has been removed. With this exception, cases of chronic Bright's disease must be looked upon as incurable, and as tending to a fatal issue. Yet the duration of the disease is subject to wide variations, and may be surprisingly prolonged when proper care and treatment are adopted. Comparing the several varieties of the disorder, we find that the large white and the albuminoid kidneys kill their subjects in a much shorter time than does the small red kidney. The ultimate cause of death to which the

kidney changes tend to uræmia, from deficient elimination of excrementitious matter. This perhaps most frequently results with the large white kidney, but in all varieties the complications which may occur are so numerous that the patient usually dies of one of them before a fatal uræmic state can appear, although minor degrees of uræmia are common. Amongst the signs which render the prognosis very unfavourable are—(1) A diminution in the amount of urine, which previously was copious, while at the same time its specific gravity is not higher than before; (2) a very low daily excretion of urea; (3) the occurrence of severe uræmic symptoms, or (4) of pneumonia, pleurisy, or pericarditis. Excessive dropsy, cardiac failure, and œdema of the lungs are dangerous symptoms; nevertheless, they are more amenable to treatment than those just mentioned. The white degenerative patches in the retina may appear when the patient is apparently in otherwise good health, yet they always indicate a severe degree of kidney affection, and the disease rarely lasts more than two years after their occurrence, unless it be the result of pregnancy (*see PUERPERAL ALBUMINURIA*). The longer the duration of the disease, the shorter, naturally, must be the expectation of life.

TREATMENT OF CHRONIC BRIGHT'S DISEASE.—The aims of treatment must be (1) to relieve the kidneys of any undue irritation, and to assist them in their eliminatory functions by promoting the action of other organs; (2) to enable the circulatory system to adapt itself to the altered conditions of peripheral resistance; and (3) to combat the distress and danger to which the patient is subjected by the occurrence of complications.

The skin must be maintained in a state of activity as nearly healthy as possible. Flannel must be worn, and warm baths and friction occasionally employed to stimulate the cutaneous circulation. The Turkish bath is sometimes of value, but it should only be used when the heart is powerful, and always with caution. Moderate exercise is to be taken, and the bowels should be induced to act at least once in the day—if necessary, a morning dose of purgative water being used for this end. The diet should be light, and contain but little nitrogenous matter. Milk and milk puddings are well borne as a rule. When the arterial tension is high, as is usually the case in granular kidney, it is best to order fish

or meat only once in the day, the other meals being of lighter character. In other cases, however, and especially in those of albuminoid kidney, nutrition must be maintained by a more liberal dietary. A moderate amount of light wine, or a glass of bitter ale daily may be permitted when the patient has been accustomed to a stimulant. Spirits and the stronger wines are generally harmful. All conditions which give rise to irritation of the kidneys, such as exposure to lead poisoning, alcoholic excess, and the gouty state, should be removed by suitable means. Any source of prolonged and exhausting suppuration should be treated by the surgeon, so as to prevent any increase of albuminoid change where such exists.

All forms of Bright's disease tend to the production of anæmia, and therefore it is desirable in nearly all cases to administer iron in some form. The citrate of ammonia and iron may be given in 10 to 15 grain doses thrice daily, or the tincture of the perchloride in 15-minim doses. Rarely will any difficulty be experienced in the assimilation of the drug if care be taken to keep the digestive organs in healthy activity. Thus, the use of iron must be suspended if the tongue be dry and coated, and the gastric condition must then be remedied by suitable treatment. The bowels, too, must not be allowed to become constipated, and therefore the astringent perchloride of iron is well combined with 20-grain doses of sulphate of magnesium. When the heart is greatly hypertrophied and the arteries are tense, it is dangerous to give iron, unless, at the same time, the circulatory condition be treated in the way to be presently described.

In cases of granular kidney the loss of albumen by the urine is generally very slight, and needs no special attention. In other forms of the disease, however, the loss is so great as to invite the physician to inquire whether measures might not be taken to control it. So far, however, no reliable remedies with such an action have been discovered.

From the account which has been given of the circulatory changes in Bright's disease it is evident that a certain degree of increased arterial tension is unavoidable, and it must be the object of the physician to prevent the tension increasing beyond a limit which may be considered normal for the disease, and at the same time to insure that the heart shall put forth such an extra

amount of force as shall suffice to overcome the peripheral resistance. Too great tension is to be avoided, because of the increased strain upon the heart and the risk of rupture of an artery in a dangerous situation; too great depression of the circulation causes danger from the liability to œdema of the lungs, dropsy of the serous sacs, and deficient excretion of urine from defective circulation through the kidney. It is a mean between these two conditions which it is desirable to maintain in Bright's disease. When the pulse is of only slightly increased tension, the heart is beating regularly, the heart sounds are normal, and the assimilative functions are in good order it is unwise to interfere with the existing condition. All that is necessary is for the patient to follow general hygienic rules.

It is rare, however, for this condition to be spontaneously maintained for a lengthened period. The patient may perhaps present himself with signs of cardiac dilatation, slight anasarca, and œdema of the lungs, a pulse of "virtual tension," and a deficient excretion of urine. In such a condition treatment must mainly be directed to sustaining the heart. Acid. nitric. dil. or acid. nitromur. dil. $\mathfrak{m}\mathfrak{x}$ - \mathfrak{xv} , with liq. strychniæ $\mathfrak{m}\mathfrak{v}$ and tinct. digitalis $\mathfrak{m}\mathfrak{v}$ - \mathfrak{x} , should be given three times a day, or even every four hours. Tincture of strophanthus and citrate of caffeine may sometimes be substituted for the digitalis with advantage. A small dose of pil. hydrarg. is occasionally advisable to relieve the peripheral tension before which the heart is failing, but in severe cardiac failure it is best omitted. Or, again, the patient may complain of throbbing headache, drowsiness, and yet insomnia; the pulse is of high tension, the heart beats forcibly, and, on stethoscopic examination, the first sound of the heart is found to be prolonged or reduplicated, and the second sound greatly accentuated at the aortic cartilage. In this condition 5 grains of calomel should be prescribed, followed in a few hours by a saline purgative draught. Another, but smaller, dose of calomel should be given after an interval of two or three days if the symptoms have not entirely subsided, and in the meanwhile saline remedies, such as the tartrate of soda and potash in \mathfrak{i} -drachm doses, together with the citrate of potash in 20-grain doses, may be given three times a day. Given in this way it is very rare for symptoms of salivation to follow the use of calomel.

By these two methods of treatment it is possible to control to a great extent the variations of the circulatory system beyond that condition which may be considered normal for the disease.

When excessive dropsy exists, the abnormal amount of fluid may be removed in various ways. If anasarca of the legs be specially prominent, it is best treated by the insertion of Southey's drainage-tubes beneath the skin. Large amounts of fluid will drain away in a comparatively short time, and there is but little risk of erysipelas or inflammation of any kind being set up round the puncture. The older treatment by incision or simple puncture of the skin is often followed by severe cellulitis. Southey's tubes also offer a convenient and safe way of removing fluid from the abdominal cavity, though here the use of an ordinary trochar and canula of small size is more advisable. Cathartic purgatives are of great use in removing dropsical effusions. The compound jalap powder in half-drachm or larger doses is the most generally efficacious, and may be administered twice or thrice a week. Gamboge, scammony, and colocynth may also be given, but commonly the jalap powder is sufficient to produce the desired effect. If, however, the dropsy should be general, and should threaten the life of the patient by interfering with vital functions, the most powerful drug which can be used is elaterium, in doses of one-fourth of a grain. It is important to watch the patient carefully when such violent purgatives are being administered, lest the diarrhœa induced should become intractable.

If free action of the skin can be procured, material relief is often afforded to dropsical and often to uræmic symptoms. Hot baths are most efficacious in promoting perspiration. They can be applied in the form of the blanket bath, already described, or the ordinary hot-water bath, or the vapour bath. The vapour bath can readily be extemporized without removing the patient from bed. The patient should be wrapped loosely in blankets, and the bed-clothes raised by a bed cradle. The nozzle of a steam kettle is now to be introduced beneath the clothes, due precautions being taken to prevent the skin being scalded by the too direct contact with the steam. The steam is allowed to pass for fifteen or twenty minutes, and at the end of that time the patient is to still remain wrapped in the blankets, and will usually perspire profusely. Other diaphoretics,

such as the compound ipecacuanha and compound antimony powders and the liquor ammonii acetatis, are less reliable. The injection of one-third of a grain of pilocarpin subcutaneously causes profuse perspiration, and, if the patient be directed to expectorate the saliva, the flow of which is, at the same time, much increased, the tendency to vomit can often be avoided. Nevertheless this drug is not so serviceable in general dropsical conditions as when used as a rapidly acting remedy in uræmic attacks.

When the urine becomes scanty, diuretics are called for. Of these the most efficacious are the acetate and citrate of potash, nitrous ether, and citrate of caffeine. The scanty secretion of urine can often be best treated by attention to the state of the circulatory system and the administration of remedies in the manner already directed. Calomel given as directed above often acts as a pronounced diuretic. In Bright's disease even more than in other conditions do diuretics seem to be uncertain in their action.

Dropsy is sometimes persistent in spite of all these remedies, and it is then desirable to administer iron, acids, and general tonics freely. Œdema of the glottis may call for special treatment, either by scarification of the swollen parts or even in extreme cases by tracheotomy.

When inflammations of the internal organs occur as complications, they must be treated on ordinary principles, remembering, however, that lowering remedies are rarely admissible. The subjects of Bright's disease are, as a rule, peculiarly intolerant of opium, and it is recommended by most authorities that this drug, if administered at all, should only be given in minute doses, and its action carefully watched. Some doubt has, however, of late been cast upon this statement, and opium has even been given in uræmic convulsions without obvious bad effects. Further experience is necessary before such a mode of treatment can be recommended with confidence. Similarly, too, dyspeptic symptoms must be treated as if arising independently of Bright's disease. Arsenic is often of great use in such conditions.

The treatment of the various conditions caused by uræmia will be found in the article upon that subject.

ROBERT MAGUIRE.

BROMISM.—When the salts of bromine are given in excessive doses,

certain phenomena are wont to appear which are known by the above name. Bromide of potassium, being the salt in most common use, is generally the cause. The prominent *symptoms* are headache, apathy, somnolence, impaired muscular power, dryness of the mouth, and anæsthesia of the soft palate and pharynx. The skin is pale, the heart's action feeble, and the extremities cold; nausea and flatulence are often complained of, and sometimes there is diarrhœa; catarrh of the bronchial tubes is common, as also loss of sexual power and appetite, with atrophy of the mammae or testicles. In advanced cases the patient becomes much emaciated, and falls into a state bordering on imbecility. A characteristic acneiform eruption on the skin is one of the earliest and most constant phenomena. It is fully described under the head of MEDICINAL RASHES.

Treatment.—The dose of the drug should be immediately diminished, or its use given up altogether. The addition of from 3 to 5 minims of liquor arsenicalis to the mixture containing the bromide sometimes prevents the appearance of the eruption.

BRONCHIAL CATARRH.—The simplest form of acute inflammation of the bronchi resembles closely the simple nasal catarrh, with which it is very frequently associated. A "cold in the head" is said to have "settled on the chest."

The *symptoms* are:—A slight sense of tightness or uneasiness across the front of the chest; a short, dry, irritative cough, which seems to aggravate this uneasy feeling; very slight expectoration of thin, sticky mucus; and a sensation of chilliness, especially about the neck and shoulders, with a feeling of depression and lassitude. There is generally some sore throat and hoarseness, and occasionally a slight rise of temperature and increase of the pulse rate. It attacks persons of all ages and both sexes, but in very unequal degree. Some individuals display a marked susceptibility to bronchial catarrh, and this persists throughout life, generally resulting before middle life in chronic bronchitis. In children, the simple catarrh is very prone to spread to the smaller bronchi, or even to the vesicular tissue, and set up broncho-pneumonia. Cold and damp weather at any season of the year is the most common exciting cause, but almost any source of chill may be held responsible. In the large majority of cases the

physical signs of this condition are limited to the occasional presence of a few rhonchi in the larger tubes.

The *pathological changes* in bronchial catarrh are limited to hyperæmia with slight swelling of the mucous membrane of the larger bronchi.

The *treatment* consists in preventing, as far as possible, the aggravation of the disease by outside influences, such as the inhalation of cold damp air and exposure to sudden changes of temperature. The patient should be kept indoors and in one room, and protected from draughts. A mustard and linseed poultice should be applied to the throat and upper part of the chest, and steam, medicated with compound tincture of benzoin (one teaspoonful to a pint of water at 140°) inhaled for about ten minutes at a time, three or four times a day. These measures, followed by a dose of Dover's powder (grs. v-x) at night, and a gentle saline purge (Friedrichshall or Hunyadi Janos water) the next morning, will often suffice to cut short an attack. A draught containing vin. ipecac. ℥v and liq. ammonii acetatis ʒss may be given every four hours if the case be sufficiently severe to require the use of drugs. In some patients an attack may be cut short by 5-minim doses of liq. morphinæ hydrochlor., repeated every hour until five or six have been taken, or by quinine in larger doses (grs. v-x). The diet should be somewhat reduced, and stimulants avoided until the febrile symptoms have subsided. The symptoms of acute catarrh usually pass quickly off, or the disease spreads further into the lung. A condition of non-febrile or passive catarrh is, however, very apt to linger after the active form has subsided. This is generally best treated by a change of air. Active exercise is beneficial, but it should be short, sharp, and vigorous, and not protracted so long as to cause fatigue. Cold sponge baths at a temperature not lower than 65° should be taken each morning on rising, the feet being at the same time immersed in hot water. The diet should be somewhat more nourishing than that to which the patient is habituated, and stimulants in the form of full-bodied wines, such as port, sherry, and Madeira, are to be recommended. Tonics, especially preparations of iron and quinine, are always useful in such cases.

Attention to the regular action of the bowels is an important detail in the treatment of bronchial catarrh. The use of the time-honoured blue pill or of

the more modern hepatic purgatives—podophyllin (gr. ¼-j), euonymin (grs. j-ij), and cascara sagrada (℥x-xx of the liq. extr.)—should not be neglected.

E. CLIFFORD BEALE.

BRONCHIAL GLANDS, Diseases

of the.—The chain of glands running beside the bronchi, and particularly those situated in the angle between the right and left bronchus at the bifurcation of the trachea, are subject to enlargement from many causes, especially in children and young persons. From their anatomical position it is obvious that any marked degree of enlargement is very likely to in some way affect the important structures which lie in close relation with them, and the presence of a group of *symptoms*, including cough of an irritative kind, not attended with much expectoration, pain, generally referred to the upper dorsal vertebræ and between the scapulæ, spasmodic dyspnoea, dysphagia, and an alteration of the voice, is considered by some writers as sufficiently clear evidence of enlargement of these glands. All these symptoms, however, may be brought about by other means. Hence the positive diagnosis of the condition is a matter of great difficulty. The physical signs also as described are scarcely more trustworthily than the symptoms.

The glandular enlargement must be extreme in order to affect the percussion note in the interscapular region, a situation in which it is admittedly difficult to be sure of slight differences only in the sound. There is also the fact that the glands, even when enlarged, lie chiefly upon the bodies of the vertebræ, and are prevented from contact with the chest wall posteriorly by the intervention of the lung, which is closely applied to the sides of the spine. The glands at autopsies on adults are often seen to be much enlarged, without any obvious change in the lumen of the tubes, one reason being that the bronchial cartilages are sufficiently strong to resist the pressure. There is, however, little doubt that in children narrowing may result. If, as is rarely the case, this be extreme, the respiratory sound on the affected side may be diminished in intensity.

Pathology.—All impurities passing through the lymphatics into the bronchial glands are liable to be arrested there, the glands acting as filters. Organic impurities, such as carbonaceous particles, are stored up in the meshes of the glands, without giving rise to any

inflammatory action; specific poisons, such as syphilis and tubercle, cause an appreciable degree of irritation and consequent swelling. Amongst other causes of enlargement are:—Simple hypertrophy, usually associated with passive enlargement of other glands in the body or with the general symptoms of Hodgkin's disease; bronchitis or any other non-specific affection of the lower respiratory passages, especially asthma and whooping cough, and malignant growths. Of these, tubercle is by far the most common, but the actual enlargement to which it gives rise is not usually very great. Syphilis is more rarely met with, but it may set up much greater interstitial changes in the gland. Morbid growths—*e.g.*, lympho-sarcoma about the root of the lung—generally begin in the bronchial glands or the peri-bronchial tissue, but in many of the recorded cases of cancer of the lung, either localized or infiltrating, the glands have been altogether unaffected. Acute inflammation, even going on to suppuration, has in rare instances been observed, and may set up general pyæmia. Chronic inflammation, leading at times to caseation or calcareous changes, is more frequently met with, sometimes as an apparently independent affection, and at others as a part of general scrofulous degeneration of the lymphatic glands. Caseating glands not infrequently give rise, by pressure and irritation, to ulceration and even perforation of a blood-vessel, usually with a fatal result. They may also invade the pericardium, and constitute one cause of purulent pericarditis.

Other pathological conditions clearly attributable to the pressure of bronchial glands are bronchiectasis and diffuse gangrene of the lungs. In such cases an enlarged gland has been found to have perforated the bronchial wall and discharged its contents into the air passages; occasionally, also, a communication has been, at or about the same time, established between the gland and the œsophagus, thus throwing the œsophagus and trachea into communication through the medium of the gland.

Treatment.—The diagnosis of this condition being almost impossible, very little need be said about its treatment, which must depend upon the nature of the enlargement. Large doses of iodide of potassium (grs. v-xxx) in the early stage, and of calcium sulphide (gr. $\frac{1}{2}$ -j) in the later stages, have been recommended as of service.

E. CLIFFORD BEALE.

BRONCHIECTASIS.—Dilatation of the bronchi is a lesion often found in association with chronic pulmonary disease, but of rare occurrence as a primary affection. It may be met with in (1) chronic bronchitis and emphysema; (2) chronic phthisis; (3) hypostatic pneumonia, with collapse; (4) cirrhosis of the lung (fibrosis); (5) collapse secondary to pleural effusion; (6) pressure on, or obstruction of, a bronchus by growths, or enlarged and infiltrated mediastinal glands; (7) chronic pneumonia; (8) catarrhal pneumonia, especially in children; (9) pulmonary gangrene; (10) as the result of the presence of a foreign body in the air passages, and in some other conditions.

Owing to the frequent occurrence of the condition in chronic phthisis, the apex of the lung is its most frequent site, but, that disease apart, the bronchi at the base are most commonly affected. A tube may be more or less uniformly dilated for the whole or only a limited extent of its course, the *cylindrical form*; or it may be dilated in isolated places, forming sacculi or pockets, the *sacculated form*. A single tube may be thus affected, or the change may be present throughout a whole lung, the so-called *turtle lung*. The dilated tube is seldom of uniform diameter throughout; more often at short intervals the lumen is narrowed by the projection of fibrous septa. The wall is generally smooth and glistening, but may become ulcerated if any septic or infective (tubercular) complication arise; it may be of less than normal density or considerably thickened, the result of inflammatory changes in the mucous membrane, the latter often presenting a velvety appearance. The tubes may be filled with pale, viscid mucus or with pus, or be quite empty; at times the contents are purulent and fetid.

The pulmonary tissue surrounding a dilated bronchus may be unchanged, but, if many neighbouring tubes be affected, the intervening tissue is almost invariably condensed from the presence of fibrous changes (*see LUNGS, CIRRHOSIS OF*).

The *symptoms* present much variety, and depend greatly upon the nature of the primary disease. If the dilated tubes be shut off from communication with the other bronchi, or if their contents remain unchanged and aseptic, no symptoms proper to the condition will arise. Paroxysmal cough, with the expectoration of a considerable quantity of muco-purulent material at intervals, followed by a period of almost complete freedom from

cough, is the most characteristic symptom of the existence of bronchial dilatation.

Should the sputum become fœtid, it may be found, on microscopical examination, to contain soft, friable, yellow masses (Traube), vegetable organisms, and needle-shaped crystals; to these latter the peculiar odour is believed to be due (see EXPECTORATION).

The only *physical sign* on which reliance can be placed is the appearance of well-marked cavernous breathing (especially if at the base of the lung), following the expectoration of a large quantity of muco-pus and the gradual disappearance of the sign as the secretion re-accumulates. If this sequence of events be clearly and repeatedly observed, it is highly suggestive of bronchiectasis; it may, however, occur when an empyema has opened into the lung, and is altogether absent in many cases. A peculiar wavy and hollow character of the respiratory sounds is also at times present in bronchiectasis.

The *prognosis* will greatly depend upon the nature of the primary disease. If the condition follows collapse of the lung, the result of pleural effusion, or arises from the lodgment in one of the bronchi of a foreign body which is subsequently expelled, recovery may occur and fairly good health be enjoyed. If, however, bronchiectasis occur as a complication of any of the other affections mentioned at the beginning of the article, the condition will probably be permanent.

If the expectoration lose its fœtid odour and gradually diminish in quantity, it is probable that the dilated tubes are either becoming obliterated or shut off from communication with the air.

Treatment.—The results of operative treatment for the relief of this condition are extremely unsatisfactory and disappointing. Some successful cases of opening and draining bronchiectasia have, it is true, been reported, but they are not free from the suspicion that the condition was really one of localized empyema in communication with a bronchus. There is now a fairly general consensus of opinion that, so far as surgical treatment is concerned, these cases are best left alone. The establishment of an opening in the chest renders the cough less effective, and, should the secretions be retained and septic changes occur, the condition of the patient is worse than before the operation. A more important objection, however, is that the affection is rarely confined to

a single bronchus, hence it is likely that many dilated tubes will remain undrained. The inhalation of creosote or a 40 per cent. solution of carbolic acid pulverized by a steam spray apparatus may be of use in diminishing the fœtor of the expectoration.

Change to a dry and bracing air and the administration of cod-liver oil, quinine, and the syrup of the hypophosphites are useful aids to the improvement of the general health.

E. CLIFFORD BEALE.

BRONCHITIS, ACUTE.—Acute bronchitis differs from simple bronchial catarrh only in the degree of its severity. It becomes more serious in direct proportion to the number of tubes inflamed and to their calibre, inflammation of the finest capillary tubes being one of the most serious conditions to which the lung is liable.

The *symptoms* are those of bronchial catarrh, but are in every respect more marked. The feeling of weight or tightness behind the sternum amounts to a sensation of rawness, which is aggravated to actual pain by the irritating cough. The sputum, at first thin, becomes, later on, thicker and muco-purulent and may at times be slightly streaked with blood. There is not much dyspœa as a rule. The cough is often paroxysmal, coming on in sudden bursts, and giving rise to much distress. The general feeling of illness and chilliness is more marked; there is frequently a rise of temperature, with loss of appetite, and thirst. Some cyanosis is occasionally present, or the face may be dusky or slightly flushed.

Physical Signs.—The movements of the chest vary in proportion to the seat and extent of the disease, the upper part being generally expanded more than usual if both bases be extensively affected. Expiration is laboured and prolonged. In severe cases there may be considerable inspiratory recession of the supra-clavicular and epigastric regions. The percussion note is generally normal. On auscultation the signs vary with the stage of the disease. The breath sounds may be diminished in intensity or harsh, and both movements of the chest may be accompanied by adventitious sounds. These vary with the amount of swelling of the lining membrane present in the affected tubes, and may change considerably within a short time. Sibilant and sonorous rhonchi are generally

present, or may be elicited by cough, and bubbling râles are frequently heard, especially over the lower lobes. Sometimes, however, even in severe cases, all adventitious sounds may be absent. Neither vocal resonance nor vibration are materially affected, but rhonchal fremitus can often be distinctly felt.

Ætiology.—Acute bronchitis may be the direct consequence of a chill in healthy persons, but is very frequently associated with some other disease of which the patient is the subject, and particularly with affections of the heart or kidney, or with emphysema or any condition which interferes with the general circulation. The exanthematous fevers, rickets, alcoholism, phthisis, gout, and rheumatism are frequently attended with more or less bronchitis, and in children the irritation of teething or the presence of intestinal worms may act as exciting causes. An attack leaves the patient with increased susceptibility to a recurrence of the disease.

Post-mortem Appearances.—The mucous membrane lining the tubes is red and congested, sometimes almost purple in colour, and covered in places with sticky and adherent muco-pus. The finer tubes appear to be somewhat dilated, although their lining membrane is often rather swollen. On cutting off a small portion of the lung and gently squeezing it, small beads of purulent matter will ooze out of the minute tubes, and this test affords the most trustworthy evidence of inflammation within them. Care is necessary, however, to distinguish between actual pus and the yellowish froth which is found in a large majority of healthy lungs.

The minute *pathological changes* are briefly as follows:—The ciliated epithelium is detached, the basement membrane thickened and œdematous and covered with transitional epithelial cells and leucocytes, the lymph spaces beneath it filled with leucocytes, and the mucous glands swollen.

Treatment.—In the treatment of acute bronchitis success often depends upon the recognition of some special factor in the case—for example, its association with gout or some other diathetic or local condition. From the outset the patient should be kept in bed, the temperature of the room being maintained at a level of about 65°, and the atmosphere being charged with steam. To steam a room effectually and rapidly, a few gallons of nearly boiling water should be poured into a large flat

bath placed on the floor. A considerable amount of moisture is then taken up by the air, and can be maintained by the use of the ordinary bronchitis kettle, but this latter apparatus alone is too feeble to make much alteration in the hygrometric state of the air, although it may maintain the moist condition, when once established, for a considerable period. In cases of bronchitis complicated by or accompanying renal disease the use of steam is not advisable, especially if dropsy be present. Care must be taken, if steam be used freely, to prevent the patient being chilled, an event very likely to happen if the temperature of the room be allowed to fall.

Diaphoretic drugs are of great service in the early stages, vinum antimoniae ℥x–xv, or vinum ipecac. ℥x–xv, with liq. ammon. acetat. ℥ss–℥j and sp. æth. nitrosi ℥ss, given every four hours, being a most useful combination. If there be difficulty in getting the skin to act, hot-air baths may be given as the patient lies in bed by means of a spirit-lamp and a large cradle. A “jacket” poultice of linseed, or mustard and linseed, changed every three hours, is a useful but rather troublesome local application.

If much pain be present in the front of the chest, relief may often be obtained by friction with a stimulating liniment, such as the lin. terebinth. acetic. of the Pharmacopœia. A few drops of oil of turpentine sprinkled on a very hot flannel compress will often relieve the pain and soothe the cough at the same time, as the vapour of the turpentine passes upwards and is inhaled.

A mercurial purge (pil. coloc. co. et hyoscy. grs. ij with hyd. subchlor. grs. ij), followed on the second day by a saline laxative (mag. sulph. grs. xxx, mag. carb. grs. x, sod. sulph. grs. xv, aq. menth. pip. ℥j), is generally advisable at the beginning of an attack. When expectoration becomes free and the skin is moist, much relief may be afforded by expectorants, such as tinct. scill. ℥xx, ammon. carb. grs. v, tinct. nucis vom. ℥x, infus. serpentariae ℥j; or syrup. scill. ℥xxx, acid. hydrobrom. dil. ℥xx, sp. chloroform ℥xv, aq. ℥j. Alcoholic stimulants, and especially brandy, are of great value in cases of cardiac weakness, although they need not be used very freely. Opium, whether to relieve cough or to procure sleep, should be used with the greatest caution, and not employed at all for the very young or the aged. Chloral (grs. ij–v) with vinegar of squill (℥xxx), or syrup of tolu (℥xl–lx) is useful in allay-

ing the spasmodic bursts of coughing. Chloral alone (grs. v-xv), or in combination with ammonium bromide (grs. v-xx), will act efficiently to produce sleep, but it should not be used when the heart's action is feeble, or when any cyanosis is present. In such cases, bromide of ammonium (grs. xxx) with tinct. hyoscyam. (℥xxx) and camphor water is to be preferred. In a few cases there may be a degree of engorgement of the right side of the heart needing relief by venesection.

In children the amount of secretion is often very great, and its evacuation ought to be encouraged at intervals; the patients should even be waked at night for the purpose. In old and young alike an emetic is often the only available means of clearing the tubes for a while of the suffocating quantities of mucus. One or two table-spoonfuls of ipecacuan wine should be employed for children, and sulphate of zinc (grs. xv-xxx) for adults.

The diet must be regulated by the powers of the patient. During the early stages, where appetite is lost, the frequent administration of small quantities of nourishing food in a fluid form is indicated, but there is no advantage to be gained by restricting the diet when once the appetite has returned.

E. CLIFFORD BEALE.

BRONCHITIS, ACUTE CAPILLARY.—A form of bronchitis in which the smaller capillary tubes are mainly attacked. It may occur as an independent affection, but more often follows inflammation of the larger tubes or complicates some disease of an inflammatory nature in another organ. It is always a most serious condition, particularly when complicated with emphysema. It is rather more common in children than in adults, but is more fatal to the latter.

Symptoms.—From the very beginning of the attack the disease presents alarming symptoms; a sense of tightness and oppression in the front of the chest comes on quickly, and rapidly increases; this is followed by urgent dyspnoea, either paroxysmal in character or continuous; a short and extremely irritating and persistent cough, at first dry, but shortly afterwards attended by viscid or ropy sputa; sweating, restlessness, and extreme anxiety. The pulse is rapid and bounding, the temperature slightly raised, and the heart's action excited and forcible.

Physical Signs.—In the early stage there is often but little to be heard in the chest except a slight diminution of the inspiratory sound at the bases, with a few small crackling râles scattered over the same area, the percussion note being unaltered. In a short time, however, these râles become audible over a larger area of the pulmonary surface, and acquire a peculiar hissing character, being accompanied by other adventitious sounds according to the amount of mucus present in the tubes. If, as is frequently the case, collapse of many lobules should occur, the inspiratory sound becomes still feebler, and, if the inflammatory process extend to the alveoli, the signs of broncho-pneumonia will be added to those already present.

Unless the attack can be cut short, the patient rapidly shows symptoms of failing power, sinks down in the bed, and ceases to expectorate. Extreme exhaustion comes on, cyanosis, with engorgement of the venous trunks, sets in, albumen appears in the urine, the temperature falls, the pulse becomes feeble and thready, and delirium follows.

The breathing now is shallow and feeble, the period of anxiety and distress seems to have come to an end, the patient usually loses consciousness, and dies quite quietly, although slight convulsions may sometimes occur.

Diagnosis.—The affection is not likely to be mistaken for any other condition except that of œdema of the lungs. The rapidity with which the symptoms are developed and their severity form a sufficiently striking contrast with the more insidious progress of pulmonary œdema.

The *prognosis* in this form of bronchitis is always unfavourable, except in those rare instances in which it occurs independently of any other disease.

The *post-mortem appearances* are those of ordinary bronchitis, but intensified. The pulmonary tissue is more acutely inflamed, and exudes much fluid blood on section; the minute tubes are often found full of pus, and frequently dilated. Not unfrequently, however, a certain amount of œdema is present at the same time.

Treatment, if it is to be of any effect, must be applied early and energetically. Counter-irritation over the bases of the lungs, or over any point where the inflammation has set in, should be employed with vigour. Dry cupping is sometimes effective, but in the more severe cases it is wiser to abstract blood freely by cupping, provided it is done before the disease has spread over a

wide area. The severity of the general symptoms at the outset must be taken as the guide in deciding to make use of it. Stimulants in the form of carbonate of ammonia (grs. v.), ether (℥xx—5j), and brandy must be used from the beginning of the attack. Digitalis is sometimes called for, but in the majority of cases very little can be done by the use of any special drugs.

Energetic treatment may sometimes check the disease before it is far advanced, and the case must then be regarded as one of ordinary bronchitis.

E. CLIFFORD BEALE.

BRONCHITIS, CHRONIC.—

Chronic bronchitis may occur as an independent disease or as the result of repeated attacks of acute bronchitis. In either form it is almost always associated with chronic changes in the lungs and other organs which may be more serious in their consequences than the affection of the bronchi. The chronic pulmonary changes are—(1) emphysema, (2) collapse of lung, (3) dilatation of bronchi, (4) chronic phthisis, (5) gangrene of lung, and (6) pleurisy. Certain diathetic conditions, especially gout, have a definite influence in the production and maintenance of a tendency to chronic bronchitis, but they are often difficult to recognize with certainty.

The *symptoms* in the uncomplicated form resemble those of bronchial catarrh, but there is usually much purulent expectoration. A sense of oppression in the front of the chest is frequently complained of, but usually corresponds to some slight exacerbation of the condition. There is always some degree of dyspnœa, varying in amount with the activity of the inflammatory process and with the nature of the secondary changes in the lungs. When complicated with emphysema, dyspnœa is a characteristic symptom of the disease. The dyspnœa often occurs in paroxysms not unlike those of asthma, the so-called "bronchial asthma," a difference, however, is to be noted in that the expiratory effort is much more laborious and prolonged than in the case of spasmodic asthma. Much distress is generally caused by the cough, which is peculiar in character, and apt to come on suddenly. The patient takes a long breath and coughs a great number of times in succession during the same expiratory movement, until the chest seems to be fairly emptied of air. This necessitates a pause for inspiration; after which a second series of coughs begins

as soon as the lungs have been sufficiently inflated to permit of it.

Physical Signs.—The chest is rounder and fuller than normal, and does not move much on ordinary quiet respiration. When associated with emphysema, it is hyper-resonant, the normal cardiac and hepatic dulness being often completely masked. On auscultation the inspiratory sound is found to be weaker than normal, and is followed by a long, wheezing, expiratory sound. The breath sounds are often accompanied by rhonchi, some deep toned and snoring, others high pitched and whistling, but almost always audible throughout the whole act of expiration. Crepitation may be present, especially at the bases of the lungs. The vocal resonance and vocal fremitus are not, as a rule, altered. Rhonchal fremitus may be felt when there is much mucus of an adhesive kind retained in the larger bronchi.

The main point of importance in the *diagnosis* of this variety of bronchitis is that the physical signs, as a rule, are equally distributed over both lungs. Bronchitis and emphysema are frequently present in association with quiescent or arrested phthisis, notwithstanding a prevalent opinion to the contrary; but the physical signs of those conditions will then usually be limited to a smaller area, and there may be other signs to indicate the real nature of the case, but these are often masked by the emphysema, and the phthisis is apt to be overlooked. The possibility of this complication should always be borne in mind in the case of spare individuals suffering from emphysema and bronchitis. Bronchitis complicated by collapse of lung is indicated by the general symptoms of the simple form of the disease, coupled with a more marked degree of cyanosis indicating the permanent want of a larger oxygenating surface (*see* ATELECTASIS).

Dilatation of tubes is present to a greater or less extent in almost every case of chronic bronchitis. Constant dyspnœa of long standing, paroxysmal cough, followed by the expectoration of large quantities of thick and often purulent and fœtid sputa, are the characteristic symptoms of this condition (*see* BRONCHIECTASIS). The subjects of chronic bronchitis and emphysema almost invariably become liable to attacks of spasmodic dyspnœa (bronchial asthma), which occur most commonly in the early morning about 4 A.M., or on waking from the first sleep; or

may be induced at any time by some of the various causes which give rise to attacks in cases of asthma. In such cases it is probable that a "nervous" factor has been added to the organic changes already present. During the attack the dyspnoea becomes for the time urgent, and the condition resembles that of asthma. Relief ensues when free expectoration is established.

Excessive secretion of sputa is a feature of some forms of bronchitis, especially in old and infirm subjects. Its character varies in different cases, being sometimes thin and watery, and at others thick and gluey in consistence.

Secondary changes commonly occur in the heart and other organs as the result of emphysema and chronic bronchitis, and are of great importance in determining the treatment and guiding the prognosis of each case.

Hypertrophy, followed by dilatation of the right cavities, tricuspid incompetence, congestion of the liver (nutmeg liver) and kidneys, with albuminuria and dropsy, is a sequence of events frequently observed.

The *post-mortem appearances* in all forms of bronchitis have much in common, especially as regards the condition of the lining membrane of the tubes. This is generally of a purplish-grey colour, from the greater prominence of the white elastic fibres of the inner coats of the bronchial wall. When examined microscopically, it is found to have lost almost all its columnar epithelium, a few small, bud-like projections from the basement membrane alone remaining in its place. The cellular tissue beneath the basement membrane is infiltrated to a greater or less degree with inflammatory cells, the muscular and glandular tissue being, in some cases, entirely destroyed. This cellular infiltration is limited by the basement membrane, and hence the muco-purulent contents of the tubes must be derived from the smaller bronchi, which are less seriously altered. The denuded membrane never becomes a granulating surface. Ulceration or even necrosis may occasionally be met with, but it will generally be found limited to small areas, where, from the irritation of retained and perhaps decomposing secretions, a definite local sore has been produced. The smaller tubes are almost invariably somewhat dilated. If emphysema be present, the lungs will in addition present the appearances typical of that disease.

Treatment.—The patient must avoid

as much as possible all exposure to chill and draughts, and warm woollen clothing should always be worn. When no special symptoms are present, perchloride of iron with spirits of chloroform is of service in improving the general health and nutrition of the lungs, and cod-liver oil is of almost as much value in chronic bronchitis as in phthisis.

If the cough be of such an irritating kind as to prevent rest, relief may be obtained by the use of soothing balsamic inhalations, or by means of opium or belladonna. A morphine and ipecacuanha lozenge, or one containing extract of liquorice grs. iij, oil of aniseed half a drop, with pulv. acacia and sugar, often gives much relief. Expectorants given by the mouth are, as a rule, of very little use in checking cough, but stimulants, such as ammonium carbonate and ether, are often effective, especially when the attack comes on at night. Sometimes an irritating cough may be coupled with a tickling sensation in the larynx, and is then generally due to hyperæmia or slight inflammation of the vocal cords. Such a condition is best treated by the direct application to the larynx of a solution of sulphate of zinc (20 grains to the ounce) by means of a brush.

Occasionally, where the cough is accompanied by pain or a sense of oppression in the front of the chest, counter-irritation to the sternum or even the interscapular region will often give relief. For this purpose a liniment containing 6 drachms of liniment. terebinthinae with 2 of tincture of iodine may be used night and morning, or a mustard and linseed poultice may be applied.

Of the many expectorant remedies the best are ipecacuan, squill, and senega, the balsamic preparations of benzoin, and syrup of tolu. Small doses of cod-liver oil have also a marked expectorant action. The salts of ammonia are of great service when there is much depression of strength. Local medication by means of simple or medicated steam inhalations is often of more immediate benefit than any general treatment. The action of steam alone is occasionally sufficient to loosen the adhesive mucus in the larger tubes and so to aid its expulsion, but the addition of one teaspoonful of tincture of benzoin to a pint of boiling water is usually an advantage. A draught containing sodium bicarb. grs. x, sodium chlor. grs. iij, ammonium carb. and potassium iodid. ãã grs. iij, sp. chlorof. $\mathfrak{m}\mathfrak{v}$, and aq. anisum ad $\mathfrak{z}\mathfrak{j}$, given in an equal quantity of warm water

before rising in the morning, will often, by assisting expectoration, prevent the vomiting which frequently occurs after long attacks of morning cough. If the amount of mucus in the smaller tubes be excessive, and neither expectorant drugs nor inhalations effect its expulsion, an emetic of sulphate of zinc (grs. xx-xxx) may be tried, but emetics, especially ipecacuan and apomorphia, must be used with a careful regard to the patient's strength, owing to the depression which they are liable to produce. Turpentine is often of great value in diminishing profuse expectoration. Change of air under like circumstances often succeeds when drugs fail to relieve.

If there be any gouty factor in the case, iodide or bicarbonate of potassium with colchicum should be added to any expectorant mixture which may be prescribed, and a saline purge administered.

In severe cases, and especially such as are subject to attacks of spasmodic dyspnoea, iodide of potassium grs. v-viij with ext. of stramonium gr. $\frac{1}{4}$, ext. of liquorice grs. ij, sp. chlorof. $\mathfrak{m}\mathfrak{v}$, in an ounce of water, is often of great service; the dose of iodide may be gradually increased to 15 or 20 grains. Bronchial asthma requires a treatment very similar to that described under ASTHMA, except that morphine injections are generally inadmissible. The antispasmodic powders containing stramonium often give great relief. Ether and carbonate of ammonia are also very useful, and strychnine is sometimes of considerable service.

With much venous engorgement and orthopnoea no hesitation need be felt in abstracting blood freely from the arm. In such conditions venesection, followed by the administration of digitalis, often gives the greatest relief, and may form the starting-point of a recuperative process by allowing the heart and lungs a period of rest from over-strain.

The great majority of persons suffering from bronchitis are not in a position to select their own place of residence, and their treatment is frequently hampered in this country by the most adverse climatic conditions. No part of the world is altogether free from cases of inflammation of the air passages, but they are less frequent in those regions where the range of temperature and the degree of moisture are not subject to any great or sudden diurnal variation, and, provided this condition is observed, the actual degree of heat is of minor importance. Of all atmospheric conditions, that of

cold damp is the most trying to sufferers from chronic bronchitis (*see* CLIMATE). The most suitable climates are those of islands and of the sea-coasts with a southern aspect. In England, Torquay, Ventnor, and Falmouth are the best winter climates, but they are much inferior to Madeira and the Canaries, Ajaccio, Palermo, or Corfu. For the advanced cases of bronchitis and emphysema the climate of Egypt is preferable. The Riviera is less suitable for cases of bronchitis, owing to the rapid changes of weather there and to the sudden fall of temperature which occurs in the evening hours.

E. CLIFFORD BEALE.

BRONCHITIS, PLASTIC.—A disease of rare occurrence characterized by the formation of a fibrinous membrane within the bronchi.

The *symptoms* are usually ill-defined, and a correct diagnosis is rarely possible until portions of the membrane have been expectorated. In its early stage the disease may simulate an ordinary attack of bronchitis; subsequently, there is severe cough and dyspnoea, only relieved by the expectoration of a cast of one of the tubes, and generally recurring during the formation of another. These attacks of dyspnoea most commonly occur at night. The affection may be limited to a single bronchus, as is proved by the exact similarity of successive portions of expectorated membrane. The casts are hollow, yellowish-white in colour, and vary from 1 or 2 to 6 or 7 inches in length. They are formed of fibrin, entangling in its meshes numerous leucocytes, and occasionally also red corpuscles and fat globules.

The *prognosis* is usually favourable, but death may occur from asphyxia either suddenly during an attempt to expectorate a cast, or slowly from wide extension of the morbid process throughout the bronchi.

Nothing is known for certain as to the *pathology* of the disease. The epithelial lining of the affected tubes is destroyed, but beyond this the morbid appearances are not characteristic.

Ætiology.—The disease occurs most often in males between the ages of ten and thirty, but has been observed in a child of five years and in a man of seventy. Not infrequently two or more members of the same family have been attacked. It may last a few days or two or three weeks, and in rare cases casts

have been expectorated at intervals for years. After apparent recovery the exudation may reappear.

The only *treatment* of much service is the inhalation of a spray of lime-water. Emetics have been useful in some cases; mercury and iodide of potassium are also reported to have given good results.

E. CLIFFORD BEALE.

BRONCHO-PNEUMONIA (Catarrhal Pneumonia).—This disease is most common in children, the inflammation of the pulmonary alveoli being as a rule secondary to that of the bronchial tubes. It is rarely met with in adults, but may occur in extreme old age. Three distinct forms of the affection may be recognized—(1) Simple acute inflammation, spreading downwards, as the result of a severe bronchial catarrh. This form usually runs an acute course, is attended with considerable danger, but in favourable cases is followed by complete recovery of the lung.

(2) Broncho-pneumonia may be secondary to some precedent disease of the lungs, as whooping-cough, or to some general febrile infective disease, such as measles, scarlet fever, small-pox, &c. In this variety the progress of the disease is slower and more insidious, and recovery is often long delayed, some permanent changes being not unfrequently left, such as pleuritic adhesions, or dilatation of bronchial tubes or lobular collapse.

(3) There is also a suppurative form, very rarely met with, which leads to the formation of scattered abscesses throughout the lungs. Cases of this kind are generally traceable to some direct local irritation, as the inhalation of septic material or prolonged immersion in dirty water, &c., and almost invariably have a fatal termination.

Localized inflammation of tracts of lung tissue, generally near the surface, leading rapidly to the formation of abscesses, is not uncommonly present in pyæmia, and will be found described under PYÆMIA, but it is distinct from the rare condition just referred to, which is due to actual inhalation of septic material.

Symptoms.—The onset of the disease is usually marked by an increase of fever and general illness in a child who has already been suffering for a few days from a simple catarrh or from bronchitis, or it may be more sudden, being preceded only by indefinite malaise or loss of appetite. The patient becomes very

feverish, the temperature sometimes rising as high as 104° , the pulse is rapid, the breathing is at first somewhat laboured, and this increases later on to considerable dyspnœa, which may at intervals be paroxysmal. The *alæ nasi* are generally dilated with each inspiration. The amount of dyspnœa will depend in some measure upon the degree of atelectasis which may have already taken place in the lung.

The range of temperature is very uncertain, and defervescence is usually slow, with irregular intermissions. A sudden fall of temperature is not uncommonly observed, but may be speedily followed by a rise, indicating either a fresh extension of the inflammation or the onset of acute pleuritis or empyema. There is much restlessness as a rule, and occasionally convulsion, and in some cases marked cerebral symptoms are present, which closely resemble those of tubercular meningitis. The cough is often slight at first, but increases after the more active inflammatory symptoms have passed off. There is in the case of adults rarely much expectoration except in the later stages; in young children it is of course absent. The tongue is generally coated and the bowels irregular, diarrhœa often coming on at intervals. The urine is scanty, and sometimes slightly albuminous. As the disease progresses, strength is rapidly undermined, and pallor and often a slight degree of lividity appears; the inspiratory effort becomes feeble, and causes a recession of the intercostal spaces and of the soft tissues above and below the sternum, and a suffocative condition may be set up which may terminate fatally. In the majority of cases, however, the disease is arrested before these graver symptoms appear. Recovery, in the simple form, is then steady and complete. Appetite returns, and all febrile symptoms disappear. Relapses are apt to take place if due caution be not observed, the lungs apparently remaining very susceptible to fresh catarrhal affections for some time after the original attack has passed away. Pleurisy or even empyema may thus occur.

In that form of the disease secondary to whooping-cough or the infective fevers the symptoms resemble the foregoing, but are neither so well marked nor so severe. The onset is slower, the amount of fever is generally less, and the course of the disease much more prolonged; recovery taking place very slowly, and often leaving behind a chronic cough,

with indications of the presence of permanent changes in the lungs.

The symptoms attending the rare cases in which a condition of diffuse suppuration is set up are acute at an early stage, and resemble those of capillary bronchitis. There is usually more or less cyanosis, marked anxiety of expression, sweating, and cough, with a varying amount of purulent expectoration. The physical signs are those of diminished breath sounds over a very large area, if not the whole of both lungs, with small and medium crackling râles equally widely distributed. These cases are of rare occurrence, and are invariably fatal. The history of the attack generally explains the cause. A condition of diffuse general lobular suppuration somewhat resembling cases of this nature is sometimes seen as a result of rapid disintegration of a widespread deposit of tubercle.

In each form of the disease the *physical signs* vary much in different individuals. Lobules or groups of lobules may become inflamed, and the disease may extend in patches scattered over both lungs, and show no tendency to remain limited to definite areas, although beginning, as a rule, about the bases. The inflammatory process is in each case accompanied by a varying degree of congestion, and sometimes of œdema of the surrounding lobules.

The physical signs of the simple form are not always obvious. The whole of both lungs should therefore be carefully searched in any suspected case. At one spot the inspiratory sound may be feeble, with slightly prolonged expiration and increased vocal resonance, whilst at another the breathing will be found harsh or bronchial. These signs are subject to frequent variation, and may occur at any part of either lung.

Small or medium crackling râles, with occasional rhonchi, may be audible, but these latter sounds, being dependent upon the amount of bronchitis present, are by no means constant.

Pleuritic friction sounds may sometimes be detected, and are apt to appear and disappear in any given area with remarkable suddenness.

The *course* of broncho-pneumonia is generally chronic, except in the primary simple cases, and even after recovery is apparently complete a tendency to pulmonary inflammation may remain. This chronic course is especially marked in children of enfeebled constitution, in whom permanent structural changes,

such as atelectasis, pleuritic adhesion, dilatation of tubes, or fibrosis, may result, to be followed possibly by pulmonary tuberculosis. When large areas of lung tissue are consolidated in broncho-pneumonia, resolution takes place much less perfectly than in croupous pneumonia; instead of resolution, softening and disintegration may follow, and lead to the formation of a cavity, but whether such a change ever occurs independently of tubercle may be considered doubtful.

Prognosis.—The prognosis of broncho-pneumonia at all ages must be given with caution. The mortality in infancy is very high, some statistics even showing that two-thirds of the cases end fatally. The younger the patient, and especially if below the age of three years, the greater is the risk. Rickety children, or those who are extremely fat and flabby, are the most liable to succumb. Amongst old persons the chance of recovery is in direct proportion to the general vigour of the patient; the strongest recover, but those in whom the constitution is weak and enfeebled generally succumb.

Pathology and Morbid Anatomy.—In the majority of cases the inflammation of the bronchial tubes precedes that of the alveoli; the swelling of the lining membrane of the tubules leads to narrowing of their calibre and congestion of the vesicles to which they lead. These in their turn become filled with serum, fibrin, epithelial, and inflammatory cells, a condition followed by active inflammation of their walls, which spreads to surrounding lobules or group of lobules. The result is that a small patch of consolidation is formed, which appears on section as a slightly raised, reddish, grey mass, with a dull or even granular surface. Such patches vary much in size, and a whole lobe may sometimes be studded with them; the interlobular divisions, however, remain well marked, by which the condition may be distinguished from that of acute (croupous) pneumonia.

The subsequent course of this inflammatory process depends chiefly upon the nature of the disease of which it has become a part. If the inflammation be of a simple character, resolution may take place, and re-expansion of the collapsed lung is possible. If, on the other hand, any septic or specific element is present, the solid lobules and patches are very likely to become softened and disintegrated, forming larger or smaller cavities in relation with dilated bronchial tubes. Such cavities, however, usually

shrink to very small proportions. In some instances neither complete disintegration nor complete absorption takes place, the consolidated tissue becoming the seat of fibroid changes which may lead to shrinking and obliteration of the affected lobules, with emphysema and bronchiectasis in neighbouring areas.

Cases are sometimes met with in which recent tubercular lesions are found in association with these chronic changes, which were probably the result of a previous attack of broncho-pneumonia.

Ætiology.—Simple acute broncho-pneumonia is common during the first four years of life. Rickety children, and those whose general nutrition is, from any cause, imperfect, are particularly liable to it, and this liability is rather increased than diminished by each attack.

Treatment.—This must be conducted on the same lines as those indicated for acute bronchitis. The patient should be kept in bed, and disturbed as little as possible, and the air of the room should be maintained at an even temperature of about 62°, and kept moist by means of steam. Cold draughts must be carefully guarded against. A warm flannel jacket should be worn, as the restlessness will often lead the patient to throw off the bed-clothes. The whole chest should be kept warm and moist by the continued use of poultices or hot flannel or spongipiline. In the case of a child a purge of castor oil, best administered in the form of castor-oil jelly, may be given at first, and repeated every three or four days if there be need for it. A saline draught of citrate of potash (grs. v–xv), sp. ammon. aromat. (℥iij–x), liq. ammon. acetat. (℥xx–lx), may be given, and Dover's powder in doses of grs. ½ to grs. iij, according to age, is often useful to obtain quiet sleep and allay pain. When the skin acts freely and the more acute symptoms begin to subside, expectorants, vin. ipecac. ℥iij–x, syr. tolu ℥xx–xl, sp. ammon. aromat. ℥iij–x, or ammon. carb. grs. ½–ij, may be substituted. In cases of much exhaustion with a rapid pulse, brandy (½ oz. to 1 oz.) in divided doses in the twenty-four hours is of great service. Cold baths or cold packing for the reduction of temperature are not advisable as a rule, but in cases of hyperpyrexia a careful sponging of the face, limbs, and body with water of a temperature of 80° may be tried. If much cyanosis be present, a few minutes in a hot bath containing a little mustard, cold water being at the same time poured over the head and upper part of the

chest in the case of children, often gives great relief. If there be much venous congestion, a venesection to 3 oz. will often prove beneficial. In the later stages, if the larger tubes become clogged with mucus, urgent dyspnoea and cyanosis result. An emetic dose of ipecacuan wine (ʒij to vj) is the simplest remedy for this condition. The diet should be restricted to milk and farinaceous foods, administered in small quantities at short intervals. Thirst may be relieved by sips of water acidulated with a few drops of dilute hydrochloric acid. It may occasionally be necessary to feed by means of small nutrient enemata, and in the most difficult cases it is advisable to resort to these in preference to the nasal tube or other mechanical means of introducing food into the stomach.

In cases of broncho-pneumonia occurring in persons of advanced age the amount of rest that is obtained, and the quantity of food that is taken, are important factors in determining the result. Strict rest in bed must be insisted upon, the patient not being allowed to rise for any purpose whatever. Milk, nutritious jellies, or peptonized foods should be given in small quantities at least every two hours. Stimulants in the form of brandy or whisky are generally called for, and must be used with freedom if necessary. A close watch must be kept upon the heart's action, and any indications of failure combated by digitalis or strophanthus in doses of 5 to 10 minims of the tincture, and by diffusible stimulants, such as carbonate of ammonia (grs. v–x) and spiritus ætheris (℥xv–xxx). The bowels in old persons need not be urged unless there be actual discomfort arising from the constipation. A simple enema is then the appropriate means of relief.

Poultices should be kept applied to the affected side or to both sides of the chest if necessary, and should be changed every four hours, care being taken to disturb the patient as little as possible in the process. Sponging of the hands, arms, and face may be done twice in the day for cleanliness and its refreshing effect.

Great care must be exercised to prevent recurrence during the period of convalescence. It is particularly apt to take place, and with each relapse the inflammation becomes more chronic and intractable. Change of air is generally advisable after the attack has subsided. The bracing shores of the Eastern

counties are most suitable to the younger patients during the summer months, but the Southern and Western coasts of Devonshire, Cornwall, or Wales, or the Isle of Wight should be selected during the cold season for young and old alike.

E. CLIFFORD BEALE.

BROW AGUE is neuralgia of the first division of the fifth cranial nerve. It is so called because the affection is common in malarious districts, and it then presents an intermittent character, the attacks coming on at regular intervals in a similar manner to those of ordinary ague. It may, however, occur independently of any malarious influence, when it is probably dependent upon some diathesis—*e.g.*, gout—the attacks being apparently induced by chill. Or it may be symptomatic of some cancerous or other affection of the bones of the skull in the immediate neighbourhood. When not dependent upon malaria, the treatment would be the same as for other forms of neuralgia (*q.v.*).

BULBAR PARALYSIS (**Labio-Glosso-Laryngeal Paralysis**) is a disease of the motor nuclei in the medulla oblongata.

The disease occurs in an acute and also in a chronic form. The latter only, which is most commonly met with, will be here described.

Two other forms of bulbar paralysis are described—the “apoplectiform,” which comes on suddenly, and is due to a lesion in the fibres descending from the cortex to the bulbar nuclei, and the “acute inflammatory,” analogous to acute poliomyelitis. These are of such rare occurrence as only to require mention.

The *symptoms* begin very insidiously, and take the form of a progressive bilateral atrophy of the muscles of the tongue, lips, soft palate, and pharynx, with consequent paralysis of these parts. The tongue is usually the first to be affected, and, before there is any wasting of this organ, the patient has a difficulty in uttering dentals and linguals. The appearance of the tongue is quite characteristic: it is atrophied, the mucous membrane is thrown into folds, like a half-empty bag, while, at the same time, numerous fibrillar twitchings are seen on its surface. The lips become weak from wasting of the orbicularis oris, so that the patient cannot purse up the mouth or pronounce explosive labials. The soft palate becomes paralysed, usually bilaterally, the patient being un-

able to close the posterior nares. This is best tested by making the patient blow up his cheeks whilst the anterior nares are nipped by the fingers; then, on suddenly removing the pressure, the air rushes through the posterior nares from the mouth.

The speech acquires a nasal tone, and the word “rub” becomes “mrum.” In most cases the soft palate loses its reflex action to the stimulus of tickling.

As the case advances the patient gets a characteristic mournful expression—though most patients are really exceptionally cheerful and good-tempered—the lower lip drops, the saliva is not swallowed, but dribbles continually out of the corners of the mouth, or hangs in ropy festoons about the fauces; the tongue cannot be protruded from the mouth, speech is lost, and only a grunting sound can be made. Swallowing is difficult, owing to regurgitation into the nose or the larynx, the muscles of which are now paralysed. The epiglottis cannot be raised, and the vocal cords cannot be approximated. The wasted muscles of the tongue respond to the Faradic current as long as there are any fibres left, but with the constant current they give the reaction of degeneration—*i.e.*, react to the positive better than the negative pole, and give a slower contraction than in health. Bulbar paralysis is frequently associated with progressive muscular atrophy and with amyotrophic lateral sclerosis, and in the latter condition clonus of the lower jaw is frequently obtained.

Course.—The disease runs a slow progressive course, and usually ends fatally in from one to four years, death resulting either from inanition, impaction of food in the glottis, bronchitis or pneumonia set up by particles of food which have got into the lungs, or from direct implication of the respiratory and cardiac centres in the medulla oblongata.

The *pathology* is similar to that of progressive muscular atrophy, and consists of gradual atrophy of the motor nuclei of the medulla, especially the hypoglossal, the spinal accessory (which supplies the levator palati), also less frequently of the nuclei of the vagus, glosso-pharyngeus, the facial and the motor division of the fifth nerve. The cells of these nuclei atrophy, and lose their processes, granule-corpuscles appear in the interstitial tissue, and in some cases the anterior pyramids are degenerated. The muscles supplied by the atrophied nuclei waste and undergo fatty and granular changes,

while the nerves supplying them are grey, from degeneration of nerve fibres and increased interstitial tissue.

The *diagnosis* of the disease does not, as a rule, present much difficulty, the gradual bilateral wasting of the muscles being its chief characteristic. It has to be distinguished from acute bulbar paralysis, which has a sudden onset; and from lesions of the cranial nerves outside the medulla, secondary to tumour or syphilitic disease. In the latter cases there is more pain, and the symptoms are not usually bilateral. There are also more distinct changes in the electrical reactions. Intra-medullary tumours often involve other nuclei, as that of the facial or sixth nerve, and other signs characteristic of a tumour will be present.

Etiology.—Bulbar paralysis is a disease of advanced life, rarely beginning before forty, and occurring in cases with an hereditary neurotic history. The causes given are exposure to damp and cold, mental anxiety, and bad living, but in a certain number of cases no cause

can be ascertained. Syphilis is not a predisposing cause.

The *treatment* of the disease is very unsatisfactory. The general health may be improved by the administration of nervine tonics, such as arsenic, phosphorus, quinine, and strychnine, and by cod-liver oil. Temporary improvement has been obtained by hypodermic injections of strychnine (gr. $\frac{1}{60}$), with small doses of morphine (gr. $\frac{1}{30}$ to $\frac{1}{24}$), but the improvement has not been permanent (Gowers). With regard to electrical treatment, the writer has never seen any definite good result from its use, but, as he has seen marked improvement in early cases of progressive muscular atrophy, a trial should certainly be given to the constant current, the positive pole being applied to the back of the neck, and the negative pole to the affected muscles, so as to produce a slight contraction.

Great care must be taken in feeding these cases; semi-fluids answer best, but in some cases œsophageal tubes or catheters have to be used.

C. E. BEEVOR.

C

CACHEXIA is the name given to the state resulting from the prolonged duration of certain diseases, and especially of those associated with impoverishment of the blood. The principal signs are an earthy, muddy, sallow, or pallid complexion, according to the disease which has induced it, and some degree of emaciation. Syphilis, malaria, cancer, tubercle, disease of the spleen, chronic diarrhoea, and rickets are the most common causes of cachexia. Some writers speak of a cancerous cachexia or a tubercular cachexia; used in this sense, the word cachexia would be synonymous with diathesis.

CANCER ORIS (Gangrenous Stomatitis; Noma; Gangrenous Ulceration of the Mouth).—*Symptoms.*—

As the disease is frequently unattended with pain, it may often have made much progress before it is discovered. Usually, the first thing that is noticed is a brawny swelling in the substance of the cheek; this softens and breaks down, and ulceration occurs on the inner aspect of the cheek; in very exceptional cases it may commence on the outer surface. The breath becomes horribly fœtid, there is a

sanious discharge, a sloughing ulcer is seen in the cheek, which may even be perforated, and there is enlargement of the lymphatic glands.

In spite of the severity of the local mischief, the child apparently suffers little pain and takes food readily. Symptoms of great prostration soon set in, the pulse becomes very rapid and almost imperceptible, and the patient dies from exhaustion or blood poisoning.

Diagnosis.—The appearances are so characteristic that the diagnosis is readily made.

The *prognosis* is almost absolutely unfavourable.

Pathology.—By Hutchinson the disease is regarded as allied to, or identical with, hospital gangrene and syphilitic phagedæna. In severe cases the gangrene, after perforating the cheek, may spread in all directions, involving lips, tongue, alæ nasi, and eyelids, and causing exfoliation of the teeth and of portions of the jaw.

Etiology.—Cancer oris is chiefly met with in children between the ages of one and five, convalescing from the acute specific diseases, especially measles. The surroundings of the patient are almost invariably insanitary.

Treatment.—The only hope of cure lies in the early and free destruction of the gangrenous surface with fuming nitric acid, the patient being anæsthetized. The use of antiseptic lotions for the mouth, and the administration of chlorate of potassium, tonics, and stimulants may subsequently be of service.

F. DE HAVILLAND HALL.

CANITIES (Poliosis), or greyness of the hair, is an acquired condition caused generally by the gradual cessation of formation of the natural pigment, or, exceptionally, by the sudden disappearance of existing pigment. Senile canities is almost a physiological process; it usually begins in the temporal region or in the beard.

Premature canities is frequently hereditary; it may result from neuralgia, worry, or overwork, may complicate alopecia areata and leucoderma, or may follow acute diseases, especially scarlatina. In summer the follicles may resume their pigment-producing function to some extent, and complete recovery occasionally takes place. In exceptional cases the hairs are "ringed"—i.e., present alternate coloured and colourless zones.

Under the influence of strong emotion, especially fear, sudden whiteness of the hair may show itself within a few hours, due either to great increase of the quantity of air normally present in the hair-shaft, or to some sudden change in the constitution of the sweat, giving it an extraordinary bleaching power. There is no cogent evidence, however, in support of the latter theory.

The only *treatment* consists in the use of suitable dyes; those containing a solution of nitrate of silver, followed by sulphur, to give a light colour, or by pyrogallol acid, to give a darker tint, are probably harmless.

J. J. PRINGLE.

CANTHARIDES, Poisoning by.—The *symptoms* are those of an active irritant poison; burning in the mouth and a sense of constriction in the throat are noticed at once, followed by pain in the epigastrium, great thirst, difficulty in swallowing, salivation, vomiting, and the passage of blood in the stools. Pain in the loins, frequent calls to micturate, and violent tenesmus of the bladder (*strangury*), are prominent symptoms following upon the absorption of the poison. The urine may contain blood, or the secretion may be sup-

pressed. Swelling of the genitals (priapism) in the male, and in pregnant women a tendency to abort, are symptoms occasionally present. Conjunctivitis, lachrymation, and blisters in the mouth have been noticed in some cases. Death may take place from coma or convulsions.

Post-mortem Appearances.—The powder may be found adhering to the mucous membrane of the stomach, and may be recognized by its glistening appearance; there will be intense inflammation throughout the whole or part of the alimentary canal, and the kidneys and bladder will also be inflamed.

Treatment.—The indication is to get the poison out of the body as speedily as possible; the stomach must be washed out thoroughly if an instrument for the purpose be at hand; if not, an emetic of sulphate of zinc (grs. xxx, in water) or mustard (a table-spoonful of the powder in water) should be administered. Barley-water, white of egg and water, or linseed tea, may be given freely, but oil should be avoided. Opium or morphine is of great service, and stimulants may be necessary.

CARBOLIC ACID, Poisoning by.

—*Symptoms.*—A burning and disagreeable taste in the mouth, vomiting, cold perspiration, small pulse, and faintness are amongst the early symptoms. The pupils become contracted and insensible to light, the breathing shallow, and the patient loses consciousness. Convulsive twitchings and a lowering of the temperature are often present. The urine is of a deep olive-green colour, turning black on keeping, and having no tendency to decomposition. Death, when it occurs, takes place rapidly, and is due to failure of respiration.

Post-mortem Appearances.—The mucous membrane of the mouth, throat, and gullet will be white, sodden, and sometimes eroded; there will be brownish stains about the mouth; the mucous membrane of the stomach, and to a less extent of the small intestine, may be thickened and corrugated; the bronchi will be inflamed, and the lungs somewhat congested. The vessels of the brain, the right side of the heart, the liver, spleen, and kidneys will be congested. All the viscera will smell of the poison, and putrefaction will be delayed.

Treatment.—The stomach should be thoroughly washed out with soda or saccharated lime dissolved in large quantities of tepid water until the fluid

returned is free from odour, or nearly so. A solution of Glauber's salts or Epsom salts may then be left in the stomach. Olive oil and white of egg may be given freely; stimulants and warmth externally will probably be required. If there be a marked degree of coma, the treatment should be as in narcotic poisoning.

CARMINATIVES are used to relieve griping pain, the result of flatulent distension of the stomach or intestines, or to prevent the pain which may arise from the administration of certain purgatives. The chief are the essential aromatic oils, ether, camphor, chloroform, ammoniacum, and the aromatic bitters. Such remedies are generally most efficacious when given in moderate doses and at short intervals.

CARPHOLOGY.—A condition characterised by plucking at the bed-clothes, and other movements of the hands, occurring in the delirium which often accompanies the later stages of febrile affections. It is generally regarded as an unfavourable symptom. The term "flocitatio" was formerly used to describe the same condition.

CARPO-PEDAL CONTRACTIONS.—A condition met with in young infants. The fists are clenched, the thumbs being bent on the palms and covered by the fingers; the toes are flexed, and the feet arched. There is also flexion of the elbows and knees. This condition may be taken as an indication of a tendency to convulsions, and is not infrequently associated with dentition or the presence of thread-worms. Another variety will be found described under the head of TETANY.

CASTS, URINARY.—This term is applied to cylindrical bodies having the appearances of moulds of the renal tubes. When present in large numbers, they form, on standing, a small deposit visible to the naked eye. To find them, this deposit must be very carefully examined (*vide URINE, EXAMINATION OF*). The addition of a little staining fluid, such as osmic acid or fuchsin, will render the paler varieties more distinct. Oblique illumination should be employed.

CHARACTERS.—Casts vary considerably in size, shape, and general appearance. In *length* they range from a mere fragment to 200 μ or more; in *diameter* from 4 μ to 40 μ ($\mu = \frac{1}{1000}$ millimeter =

FIG. 1.*



Casts from urine in a case of acute nephritis of a fortnight's duration. *a*, Epithelial casts. *b*, Casts containing blood discs and granular matter. *c*, Granular casts, many of them containing fat globules. *d*, Vaginal epithelium. *e*, Vesical epithelium. *i*, Flax fibre. *k*, Blanket hair.

* The above drawing is from Dr. Beale's work on "Urinary Deposits."

FIG. 2.*



Casts from urine in a case of acute suppurative nephritis.
They contain blood and pus cells.

FIG. 3.*



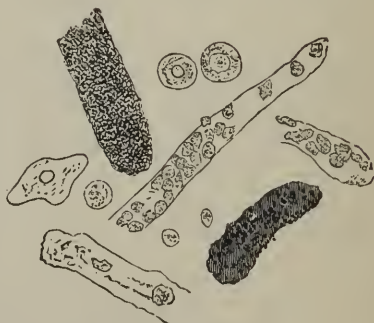
Fatty casts.

$\frac{1}{250000}$ inch; diameter of red blood disc = 7.5μ). The large majority fall into one of two groups—(1) those of 10 to 15μ diameter, called “small,” and (2) those of 25 to 40μ , called “large.” In *shape* they are generally straight or slightly curved cylinders, but sometimes much twisted, convoluted, or fissured. As a rule there is a fractured surface at each end, but occasionally these are round, or, much more rarely, tapering. The outline is for the most part distinct and sharp, but has more of the highly refracting characters of a vegetable fibre.

The more characteristic appearances, and hence the names, vary according to the tissues embedded in the mould or cast, which essentially consists of a homogeneous, almost invisible matrix. Thus there are *epithelial* casts (Figs. 1 and 4), containing scattered patches of more or less altered renal epithelium; *blood* casts (Figs. 1 and 2), with red blood discs in their interior; *pus* casts (Fig. 2), studded with degenerate leucocytes; *fatty* casts (Fig. 3), with fat globules singly or in groups; *granular* casts (Figs. 1 and 4), with finely divided granular debris either in scattered masses or completely filling the cast; *hyaline* casts (Fig. 2), clear and transparent, with a few lateral fissures, but homogeneous in structure. Others are named according to the belief held concerning their origin—*e.g.*, *waxy* casts, which give the albuminoid reaction, and *mucous* casts, probably made up of mucus.

MODE OF FORMATION.—The diameter of a cast depends on that of the tube in which it is formed. Not only does this vary within wide limits in different parts of the cortex and pyramids, but it may be indefinitely increased by loss of the epithelial lining or by dilatation of

FIG. 4.*



a, Epithelial casts. b, Granular casts.

the tubes themselves. The convoluted tubes were originally supposed to be the chief sites of cast formation from the shape of the casts, because blood and pus cells would be more readily accessible in the neighbourhood of the glomeruli, also from the fact that fatty degeneration of the epithelium had not been observed elsewhere, and, because, after death, casts were found as plentifully in the convoluted as in the collecting tubes.

But to escape from the convoluted tubes the casts would have to pass through others whose diameters are much smaller either than those of the tubes in which they were supposed to be formed or than those of most of the casts themselves as seen in the urine. Now many writers, while admitting their pliability, doubt their power of accomplishing this feat, and are therefore of opinion that they really originate in the

* The above drawings are from Dr. Beale's work on “Urinary Deposits.”

loops of Henle and in the terminal tubes, but never in the convoluted.

It must be remembered, however, on the other hand, that the cast may gain in consistence as it passes along the tubes and during its sojourn in the bladder, and therefore that at the time in question it may be sufficiently compressible to traverse the smaller tubes.

Branched casts, which are rare, are believed to be formed in the collecting tubes, and mucous casts in the folds of mucous membrane present in the membranous part of the urethra. Mucous casts occasionally contain spermatozoa. The seat of origin of the other varieties must be considered as undecided.

The nature of the process of cast formation is not more clearly understood than the site. The essential part of the cast is the matrix, and four theories are advanced to account for its origin. According to one it is fibrin; to another, one of the products of disintegrated epithelium; to a third, an exudation from the inflamed epithelium; and to a fourth, an albuminous exudation, possibly the result of an inflammatory process which tends to detach the epithelium from the sides of the tubes.

There is certainly no reason why the matrix should in all cases be similar, and there can be but little doubt that the majority of casts result from an inflammatory process, as they occur in greatest quantity in active inflammatory conditions, and their number is often directly proportional to the amount of albumen present in the urine. The clear transparent matrix may be partly due to the action of the acid urine on the coagulated fibrinogen. It is impossible to say in what proportions exudation from the blood-vessels and the products of disintegrated epithelium enter into its formation. The epithelium in casts is generally very much altered. It is probable that some blood casts are simple coagula, and composed, therefore, of fibrin and corpuscles; but this explanation does not seem probable where two or three blood discs are scattered through a cast of considerable size. That the matrix may be simply an epithelial exudation is affirmed by those who have observed the casts lying by the side of epithelium from which masses of apparently similar material projected.

SIGNIFICANCE.—While so much difference of opinion exists concerning the place and mode of origin, the diagnostic significance of their presence must mainly depend upon clinical experience. This

may be thus shortly summarized:—(1) If the prevailing type of cast, be of the "blood" or "epithelial" varieties, acute nephritis, either primary or supervening on chronic disease, is the probable condition. (2) Fatty casts occur during convalescence from acute nephritis, or in cases where that condition has become chronic. Their persistence points to the latter alternative. (3) Granular casts are possible in acute disease, but are generally found in large numbers in cases of contracted kidney. (4) Blood and pus casts in cases of pyelitis show that the kidney substance is also involved. (5) Hyaline casts may be found when there is no other evidence of disease. (6) Casts are found in largest number when active inflammatory changes are taking place in the tubules—that is, in cases of acute or sub-acute nephritis.

H. MONTAGUE MURRAY.

CATALEPSY is a morbid state of the central nervous system, characterized by a condition of muscular contraction known as *flexibilitas cerea*. This is such that there is no voluntary movement and no opposition to passive movement of the limbs or body in any direction; and along with this there is a power of retaining for an indefinite time any position imposed, much longer than is found possible by voluntary effort in health. Such a condition is exceedingly rare unless accompanied by other nervous disturbance, most commonly by more or less complete anaesthesia, loss of memory, and unconsciousness. In primary cases, where catalepsy is the chief symptom of disease, its onset is rapid. It is met with in subjects of from twenty to thirty years of age, both men and women of nervous temperament, and follows emotional excitement or exhaustion. It may fix its subject motionless or speechless in the midst of action or speech, and release him only after some minutes or hours, without memory of the interval, to finish what he was engaged upon. Of any constant electrical changes in the nerves or muscles during the attack there is no satisfactory evidence, and beyond the abnormality of contraction and anaesthesia there may be little noteworthy in the physical condition during the attack; more probably there will be a weak pulse, slow breathing, and open, staring eyes. Now and then such a state has been known to last several weeks, and artificial feeding has been found possible; the temperature, however, being

reduced, the functions somewhat in abeyance, and the patient needing little nourishment. More often there are groups of less severe attacks, each lasting a few minutes, in which some periodicity may develop itself.

The cataleptic state is found, although rarely, as a symptom of importance in many diseases. It has ranked as a twin sister to hysteria, and is frequently intimately associated with its other symptoms; hystero-catalepsy may alternate with hystero-epilepsy, or hysterical chorea (Charcot); it occurs with tetanus and various forms of mania and melancholia (cataleptic torpor), though it ceases when they have degenerated into dementia. It is a grave though very rare symptom in some acute diseases, such as typhoid fever, ague, and pneumonia. It belongs to the symptoms contagious by involuntary imitation, as in the religious epidemics of the Anabaptists in 1686 and of the Calvinists of St. Médard in 1731. It often forms a part of the hypnotic state (*see* HYPNOTISM), and may then follow on gentle pressure upon the closed eyes of sensitive subjects or on suddenly exposing them to a bright light. In this way, by unilateral action or suggestion, an artificial hemi-catalepsy may be induced. By itself it has no serious consequences, but it may be very inconveniently persistent. Primary attacks often terminate in some small crisis, as epistaxis or menstruation. They can rarely be cut short by cold water, faradization, massage, or other treatment, but their recurrence may be gradually prevented by an active life, change of scene, moral stimulus, and encouragement. The pathological condition is as yet unknown.

A. T. MYERS.

CATARRH signifies inflammation of a mucous membrane with increased secretion of fluid from that membrane. The term is generally reserved, when used by itself, for catarrh of the mucous membrane of the nose, throat, and larynx, constituting what is popularly termed "a cold." It usually follows a wetting or exposure to cold of some kind, and may or may not be preceded by chilliness and vague feelings of pain or discomfort in the limbs and joints. In many persons the first symptom is dryness or soreness of the throat, followed in a few hours by sneezing and a profuse watery discharge from the nostrils. Hoarseness and lachrymation will be present in very varying degree,

being always a prominent feature of the attack in some individuals, but wholly absent in others. In the course of the second day the discharge from the nose usually becomes less abundant and more turbid, and from this time the mucopurulent character of the discharge is more marked, whilst it diminishes in quantity. Smell and taste are diminished or lost during the acute stage, the former, indeed, not being regained until the discharge has nearly ceased. Deafness is by no means uncommon, and soreness and excoriations about the lips are often seen.

Treatment.—An attack may sometimes be cut short if at the very commencement measures be taken to promote copious diaphoresis—*e.g.*, a Turkish bath—whilst a hot bath before getting into bed, or putting the feet into hot water with a little mustard in it, are well-known domestic remedies, which may be aided by drinking some hot wine or hot spirit and water. A full dose of quinine (grs. x) taken upon the approach of the first feelings of discomfort, or small doses of morphine, or 5-minim doses of the tincture of aconite every half-hour for three hours may also have the desired effect. Tincture of belladonna in 20-minim doses combined with 10-grain doses of bromide of potassium has been found serviceable, and it has also been recommended to brush the nose and pharynx three or four times with a 6 per cent. solution of cocaine. When the catarrh is established, Ferrier's snuff may be recommended; it contains morph. hydrochl. grs. ij, bism. subnit. ʒvj, and gum acacia ʒij. In chronic cases quinine in moderate doses is useful.

CAUSTICS are substances which, when applied locally to organic matter, cause its destruction. The actual cautery (a red-hot iron), Paquelin's cautery, and the galvanic-cautery are the most efficient. As chemical caustics, the hydrated oxides of potash and soda, nitrate of silver, and nitric acid are the most common, but the acid nitrate of mercury, chromic acid, chloride of zinc, chloride of antimony, and glacial acetic acid are also powerful caustics.

CHEIRO-POMPHOLYX (Dysidrosis, Pompholyx) is an ill-defined, inflammatory disorder of the skin of the hands, and often also of the feet, characterized by the development of peculiar vesicles, or blebs, arranged in groups. These are deeply seated, and have the

appearance and feel of sago-grains; they are distributed chiefly on the soles and palms, and especially along the sides of the fingers. The surrounding skin is at first little, if at all, inflamed. Blebs are usually formed by the fusion of smaller vesicles, but occasionally appear primarily. The vesicles either suppurate and rupture, causing excoriation and maceration of the skin, or more frequently are absorbed, leaving the skin unaffected. Their appearance is preceded and accompanied by violent itching, a feeling of stiffness, and burning pain. The eruption is roughly symmetrical. The disease avoids the extremes of life, and is especially common in women and persons of neurotic disposition, with clammy hands (chronic hyperidrosis). It is almost invariably recurrent, and is rare in winter. After frequent recurrence the nails become stunted and brittle. By some the vesicles are thought to represent dilated sweat ducts containing retained sweat; by others the disease is considered to be of neurotic origin, and allied to herpes. More probably it is an atypical eczema, as eczema frequently co-exists on the trunk, or is in anatomical continuity with the disease, which sometimes appears to be provoked by external irritants.

The *diagnosis* from scabies may occasionally present some slight difficulty.

Treatment must be mainly constitutional; arsenic and quinine are of special value. Locally, lead lotions, thymol in weak alcoholic solution, or diluted liquor carbonis detergens may be used to allay itching.

J. J. PRINGLE.

CHELOID (Keloid of Alibert, Kelis) is a somewhat rare disease of the skin, characterized by the development of new growth from the connective tissue. Formerly a sharp distinction was drawn between "true," *i.e.*, spontaneous, and "false," *i.e.*, cicatricial, cheloid; clinical experience, however, teaches that probably all cheloid arises from pre-existing scar-tissue or inflammatory exudation. The extensive scars resulting from burns, lupus and syphilis are specially prone to form the starting-point of cheloid, but it may originate in and spread from the minute scars following blisters, variola, varicella, acne, leech-bites, or piercing the ears for ear-rings. Less frequently the process may start from deep inflammatory changes—*e.g.*, boils. The coloured races are more often affected than whites, brunettes more often than blondes. Some families show

a marked proclivity to cheloid formation, and in some persons every scratch or scar may become affected, evidencing a peculiar constitutional taint. The disease is commonest in middle-aged people, but the cicatrices resulting from strumous ulceration in children are often markedly hypertrophic. Cheloid is commonest, and presents its most characteristic form, over the sternum; it is also common about the shoulders and neck, but may, as already indicated, occur upon any part of the body.

Symptoms.—The growth first shows itself as a firm, raised, smooth, glossy, cicatriform streak or nodule, which may be whitish, pinkish or red in colour. By its gradual increase a larger, prominent tumour is formed, elastic to the touch, and hairless; sometimes dilated venules course over its surface. From this central tumour irregular raised bands or spurs extend in various directions into the surrounding skin like the claws of a crab—hence the name of the disease. Considerable pain is usually complained of, especially when the part is manipulated, as well as itching, stinging, and burning sensations. The growth may extend indefinitely, the older portions becoming atrophic and depressed, the more recent, irregular and tuberosus; but suppuration and ulceration are of very exceptional occurrence, as is also the development of malignant growths from it. The increase of the tumours is invariably slow, and after a certain time—it may be years—spontaneous arrest usually occurs, followed by gradual diminution in size, but they seldom totally disappear. If removed, either by the knife or by caustics, they almost invariably recur *in loco*.

A rare form of cheloid is described by Mr. Hutchinson in which the new growth is confined to the deeper layers of the corium and to the subcutaneous tissue, the result being extensive flat indurations covered with healthy skin.

Pathology.—The growth originates in the corium, of which the vessels are dilated and the meshes infiltrated with numerous cells, which press upon and destroy the sebaceous glands and hair follicles, obliterate the papillæ, and rapidly form dense fibroid tissue. The fibres lie closely packed together, in bundles, in the long axis of the tumour, with a few spindle cells and nuclei among them, and in the later stages of the disease are very poorly supplied with blood-vessels. The condition is closely

allied to granuloma on one hand, to sarcoma on the other. The vessels are dilated for a considerable distance outside the growth. The condition differs clinically from simple hypertrophy of a cicatrix in its aggressive extension beyond the scar tissue; possibly the growths, when multiple, might be mistaken for fibromata or malignant tumours of the skin.

Treatment.—The application of mercurial or lead plaster appears sometimes to check cheloid growth, probably by exerting compression on the vessels. Belladonna plaster is useful in alleviating pain, and occasionally recourse must be had to morphine. Destruction by caustics is unsatisfactory; removal by the knife is only efficacious when the incisions are made very wide of the growth, and is not usually an advisable measure. Linear scarification and electrolytic puncture have been recently warmly advocated. It must be borne in mind that spontaneous arrest and partial recovery usually take place, especially in young persons.

J. J. PRINGLE.

CHEYNE-STOKES' RESPIRATION.—An undulating type of breathing in which the respirations gradually become more frequent and, at the same time, deeper, until a certain point is reached, when they slowly become more shallow and less frequent, until the person finally seems to have stopped breathing; after a pause, which may be as long as half a minute, the respiration begins again very slowly, but gradually increases in frequency and depth, and thus the cycle is established. This condition is most common in the late stages of tubercular meningitis, but it is also met with in some forms of cerebral hæmorrhage, and in fatty disease of the heart, when presumably it is due to the influence of insufficiently oxygenated blood on the medulla oblongata.

CHICKEN-POX (Varicella).—An acute and highly contagious disorder, characterized by the appearance of successive crops of vesicles. It is most common in children under four years of age, but older children are also liable to it, and in rare instances the disease also occurs in adults.

Symptoms.—The invasion may be quite sudden, or its onset may be heralded for a few hours by febrile symptoms and general malaise, but it is rare for the premonitory symptoms to last more than a few hours before the appearance

of the rash. This comes out as a rule first on the back or chest in the form of scattered, slightly raised, round, red or rose-coloured spots, which disappear when the skin of the part is stretched. In the course of a few hours each spot becomes raised, by the accumulation of serous fluid in the underlying layers of skin into a small vesicle containing an almost clear or slightly yellowish fluid. The vesicle is round or oval, tense, varies in size from a hempseed to a split-pea, and has no central depression. In the course of twenty-four or thirty-six hours the contents of the vesicle become cloudy, its apex falls in, and it gradually shrivels up, so that by the fourth day it is reduced to a mere scab, which may then crumble away leaving no trace of its existence, but, as the scabs often itch and are scratched, it is quite common for a few scars to be left here and there. On the following morning a new crop appears, generally far more numerous than the first, and not confined to the trunk, the limbs, head, and sometimes the face being attacked. As the disease advances a fresh crop of spots makes its appearance every morning for four or five days, so that by the fifth day the eruption may be studied in all its stages, from the initial red spot to the final crumbling scab. The total number of spots may vary from ten or twenty to one or two hundred or even more. A red areola is frequently seen, though it is by no means necessarily present in any stage of the vesicle. Vesicles are not infrequently seen on the palate, mucous membrane of the cheek, and sides of the tongue, and also on the labia or prepuce. It is probable that in its early stages the vesicle contains septa dividing it off into compartments, but when fully developed the septa all become absorbed, and the vesicle is then undoubtedly unilocular. The marking of the scars, however, so closely resembles what is seen in small-pox as to make it almost certain that there must have been septa in the vesicle at the time of its original formation. The temperature does not, as in variola, subside when the eruption appears, although in some cases a slight fall may occur until the evening, when it again rises. Sometimes there is no fever throughout and no feeling of ill-health.

The *period of incubation* is uncertain, but it is probably long; most writers are agreed that it may last a fortnight, if not more.

Mr. Hutchinson has described under

the name of varicella prurigo some cases in which, after undoubted chicken-pox, there has been a persistent eruption exactly like the original disease, and accompanied by much prurigo. In a few instances, generally in unhealthy and tuberculous children, the vesicles have taken on a gangrenous ulceration, and the child has succumbed. Acute tuberculosis, too, has been known to supervene so soon after chicken-pox as to suggest something more than a coincidence; organic disorders of the central nervous system have also, in rare instances, been noticed to follow an attack of chicken-pox.

As regards the *diagnosis* the chief difficulty is to distinguish between this affection and modified small-pox. If the eruption be observed to go through the successive stages above described, there is no room for doubt, but when the patient is only seen once and in the early stage, the difficulty may be very great. In small-pox there will almost always be a history of two or three days' malaise before the first appearance of the eruption, which may have been preceded by a scarlatiniform rash, and the papules will have from the first a hard, shotty feel which is never present in chicken-pox. It will often happen, however, that a certain diagnosis cannot be made on first seeing the patient.

It is unnecessary to re-open the discussion as to the identity or otherwise of small-pox and chicken-pox. Suffice it to say, that an attack of the one does not protect against the other, that vaccination affords no protection against chicken-pox, and that a person whilst suffering from chicken-pox can be successfully vaccinated.

No special *treatment* is needed, but it is prudent to keep the patient in bed whilst the eruption is developing, and to isolate him from those who have not had the disease.

JOHN ABERCROMBIE.

CHILBLAIN (*Pernio*; *Erythema Pernio*) is a local inflammation of the skin resulting from exposure to cold. The condition is occasionally observed in old persons, but is far more common in the young, especially in those of lymphatic constitution, with a tendency to suffer from "blanched fingers," "cold blue hands," and other manifestations of a weak peripheral circulation. Anæmic girls are particularly liable to the affection, and in them it occurs in the most aggravated and obstinate form. After

full development is attained, the affection is far less frequently met with.

Chilblains always appear first in winter, and generally cease spontaneously when the weather becomes warm. The hands, especially the fingers and knuckles, the margins of the feet, the heels, toes, ears, and the tip of the nose are the most favourite seats.

The lesions generally develop during the night, when the body is at rest; they consist of variously sized, single or multiple, circular, raised, erythematous spots or patches, which are at first of a delicate pink colour, but soon assume a red and subsequently a purplish hue. Itching, smarting, or burning is severe and is aggravated by warmth. If the inflammation progress, vesication occurs over the patch, and ultimately large bullæ containing clear or blood-stained serum may form. The cuticle covering the bullæ may separate and leave a denuded, sloughy surface, the most advanced stage of the affection. Recovery then takes place slowly by granulation, and shallow scars may result, comparable to those produced by erythematous lupus, with which affection, indeed, this disease has much in common. It has also many interesting points of affinity with Raynaud's disease.

Treatment.—Young persons liable to chilblains and allied conditions ought to be forced to take regular and vigorous exercise. Standing in front of a fire for considerable periods is specially likely to induce the condition. The clothing must be warm and woollen, thick gloves and stockings being worn. The boots must on no account be tight or of the kind known as "elastic sides." The sleeping chamber should be warm.

On the first appearance of the signs of chilblains, the parts should be rubbed with cold water or even snow, in order to restore the circulation gradually; afterwards rest, moderate warmth, and a little calamine lotion (3j ad 3j with glycerine) suffice to prevent their further development. If the erythematous stage be reached, tincture of iodine is useful, and for application to exposed tracts it may be decolorized by the addition of ammonia. If a little more stimulation be necessary, equal parts of the liniments of camphor and belladonna, or of turpentine and iodine, or of soap and chloroform are all efficacious, and may be followed by a lead or soap plaster. Should vesication occur, painting with compound tincture of benzoin, followed by smearing with resin ointment, answers admir-

ably. The same treatment may be applied to the bullæ after the removal of the epidermis. In other cases more soothing applications (*e.g.*, calamine or borax ointment) are preferable. Sometimes erythematous patches, which constantly threaten to "break," persist indefinitely; they are best treated by painting with a solution of nitrate of silver in spirits of nitrous ether (grs. xv ad 3j) or with liquor gutta-perchæ containing 5 per cent. of salicylic acid. Galvanism, as in Raynaud's disease, may often be used with advantage.

The constitutional treatment is of much importance; it embraces good food, hygienic surroundings, regular exercise, and the administration of tonics, especially quinine, strychnine, and iron.

J. J. PRINGLE.

CHILL.—It is difficult to assign its proper value to this term. There is probably no disease which has not justly or unjustly been attributed to taking a chill. It is often the only assignable cause of the most varied affections. A chill consists in a sensation of cold and shivering coming on within a few hours of exposure to cold or wet.

CHLOASMA (Melanoderma; Melasma) is an acquired condition characterized by the presence of smooth, pigmented patches, or a diffuse general pigmentation of the skin, the tint of which may vary from yellow to dark brown. In a few well authenticated cases diffuse pigmentation has appeared suddenly after strong mental emotion or acute disease, but in the great majority of cases the disease is secondary to disorders of the female generative organs.

Chloasma uterinum affects chiefly the forehead, temples, cheeks, the nipples, and the skin of the abdomen along the middle line. It is often very marked during pregnancy, and subsides—but only partially—after parturition; in a milder degree it may affect brunettes at the menstrual periods, or women suffering from any form of ovarian or uterine derangement; it usually disappears after the menopause. Chloasma may also follow dyspepsia, and is popularly associated with hepatic disturbance (C. hepaticum, liver spot). This form of the disease may be mistaken for tinea versicolor. It is noteworthy that the local pigmentation resulting from the application of mustard, cantharides, iodine, or chrysarobin may sometimes be permanent.

Diffuse Pigmentation of the Skin.

—The skin often becomes of a deep bronze tint from prolonged exposure to the sun's rays or to vicissitudes of climate ("morbus erroneus"). A similar condition may accompany Addison's disease, Graves's disease, chronic tuberculosis, carcinoma and malaria, or may result from the prolonged administration of arsenic or of nitrate of silver ("argyria"); in the latter case the colour is greyish-blue, and is due to the deposit of the reduced metal in the skin. Pigmentation of the skin may complicate varicose eczema, senile atrophy of the skin, scleroderma, leucoderma, lepra, psoriasis, and any chronic eruption accompanied by severe itching and scratching, especially pediculosis and prurigo. Deep pigmentation follows the subsidence of some forms of papular syphilis and erythema, also of purpura and lichen planus. Occasionally, malingerers and hysterical persons paint the skin to simulate disease. The pigment is always easily removed with a dilute solution of chlorinated lime.

Treatment must first be directed towards remedying any accompanying constitutional disturbances. Pigment is best removed by the continuous application on lint of a sufficiently strong alcoholic solution of corrosive sublimate to remove the epidermis and with it the pigment (usually about 1 per cent.), dressing the part afterwards with starch powder. The new epidermis is at first devoid of pigment, but it usually returns subsequently. The same purpose may be more slowly but less satisfactorily accomplished by dilute solutions of acetic or hydrochloric acid used as lotions. Quite recently Unna's salicylic acid plasters, applied for twenty-four hours consecutively, have been much used.

J. J. PRINGLE.

CHLORAL HYDRATE, Poisoning by.—The *symptoms* of an over-dose of hydrate of chloral are profound sleep, stertorous breathing, and flushed face; at first, the person can be roused, but the coma gradually increases, the body temperature sinks, and death follows with more or less of collapse. Dangerous and fatal symptoms are more readily produced in drunkards than in healthy subjects. The drug is frequently used in combination with bromide of potassium, which aids it in producing dangerous symptoms.

The *post-mortem appearances* present nothing at all characteristic; there will be the usual signs of death from asphyxia,

and the brain may show an excess of cerebro-spinal fluid.

Treatment.—The chief object is to combat the loss of body heat; placing the patient in a warm atmosphere and surrounding him with hot bottles, the inhalation of warm air, and stimulation of the skin by friction are the best methods to attain this object. Artificial respiration and the application of both the constant and induced currents to the chest and limbs may be tried to overcome the coma. The stomach pump should be used or emetics given, and the hypodermic injection of strychnine (gr. $\frac{1}{5}$) has been recommended.

Chronic Poisoning.—Amongst the ill effects of the habitual use or abuse of this drug, those relating to the nervous system are the most notable. Mental enfeeblement, melancholia, and mania have sometimes been traced to abuse of chloral. An erythematous or scarlatinial rash is apt to appear, and is often followed by desquamation and albuminuria. There may be acute general eczema. The use of the drug should be at once and entirely abandoned.

CHLOROSIS is the most common form of idiopathic anæmia; it received this name from the peculiar greenish tint of the complexion which characterizes it. The affection is practically limited to the female sex, and is most common about the period of puberty and early womanhood. It is often, but not invariably, associated with amenorrhœa, rarely with menorrhagia; and, although styled "idiopathic," its occurrence is favoured by many conditions, which possibly may operate in conjunction with the essential cause which as yet remains unknown. It must be remembered that it occurs at a period of life when the organism is undergoing an important evolution, when the menstrual function is about to make an increased demand upon it, and when, therefore, it may reasonably be supposed to be more amenable to influences tending to produce anæmia. At any rate, chlorosis is common in girls who follow sedentary occupations, or are exposed to fatigue, or live secluded from sunlight. In order, however, to account for its supervention, an explanation has been sought in an arrest of development of the vascular system, which is believed to become inadequate to the performance of the increased function demanded from it. Others, again, have referred chlorosis to a deficiency in the gastric secretions, or to a "self-intoxication"

from the absorption of fermentation products resulting from gastric dilatation or fæcal retention—the latter view being supported by the good results attending the administration of aloetic purgatives. So far as an examination of the blood goes, the chlorotic condition would seem to be more allied to imperfect formation of corpuscles than to their excessive disintegration, a derangement of hæmatogenesis rather than of hæmatolysis. But the subject remains one of the most obscure in pathology.

The *blood* in chlorosis is (1) paler than normal, owing to a marked deficiency in hæmogoblin rather than of red corpuscles, for, although the latter are below the normal in number, the percentage amount of hæmogoblin is almost invariably less than that of the corpuscular richness. (2) It is also more watery than normal, and the corpuscles do not tend to form rouleaux so readily as they do in healthy blood. (3) It is said to be deficient in serum-albuminates, but more observations are needed on this point. (4) As to the corpuscles themselves, there is no manifest disproportion between the numbers of the white and red globules, but the latter occur in greater variety as to size than in health, many being smaller (microcytes) and some larger (megalocytes) than the average.

The *symptoms* of chlorosis are well marked. They are those common to pronounced anæmia, of which, indeed, this form is often taken as the type. First, there is the colour of the skin and visible mucous membranes. The former is often of a waxy pallor, with, perhaps, a slightly greenish or yellowish-green tint, easily distinguished from jaundice by the pearly whiteness of the sclerotics. The cheeks have often a pinkish flush which contrasts markedly with the surrounding pallor. The lips are notably pale and bloodless, and the conjunctiva, observed by everting or drawing down the lower lid, is also markedly pale. The bed of the nails shows well the pale and bloodless character. The general nutrition is apparently unaffected, or, at any rate, there is no loss of subcutaneous fat, often indeed the reverse—viz., a tendency to an excessive deposit of this tissue. But in contrast to this apparently good nutrition there is marked debility, or rather muscular feebleness, the subject being readily fatigued. As regards the nervous system, the chlorotic is generally rather slow in intellect and prone to sleep. She presents often in a well-marked

degree the condition described as "neurasthenia." Effort, both mental and physical, is a weariness to her, and, although her sleep is heavy, it is unrefreshing, and frequently in the morning hours she will be torpid and somnolent, becoming bright and wakeful towards evening. Sometimes, however, the condition is rather the reverse of this, and she is irritable and restless, suffering much from headaches, which are not specially localized, being mostly either frontal or occipital. Hysterical phenomena are not very common, although the older writers laid stress on the caprice and waywardness of the appetite. One of the most frequent symptoms complained of is breathlessness, especially on exertion. She finds it increasingly difficult to mount stairs, or do any work requiring effort, without panting for breath. Yet the lungs exhibit no physical signs of embarrassed circulation. The characteristic signs are those of the circulatory system. Subjectively the patient may complain of palpitation. The heart's action may be rapid, and is always easily excited. On examination there is generally to be found evidence of enlargement (? dilatation) of the left ventricle, shown by a slight outward displacement of the apex beat, and an increase in the lateral dullness. Sometimes also a faint pulsation is visible in the third left interspace near the sternum (? auricular). There is invariably a systolic bruit, loudest over the pulmonary area, but often audible over the whole præcordia. The character of this bruit is mostly soft and blowing, but is sometimes so remarkably harsh and grating as to be mistaken for pericardial friction (it has, indeed, been suggested that it may be due to an unusual dryness of the serous membrane). Nor is there agreement as to its precise mode of production, the two main views being (1) that it is generated in the pulmonary artery, by the altered quality and perhaps also the diminished quantity of the blood; and (2) that it is a true mitral reflux, from the closure of the valve being rendered imperfect by the weakening of its muscles and the dilatation of the ventricle, the unusual site of a bruit so generated being explained by the retraction of the lung uncovering the auricular appendix. On either view the lessening and final disappearance of the murmur with the restoration to health is explicable. Besides this bruit, systolic murmurs are often heard over the aortic and tricuspid

area and in the larger arteries on the slightest pressure, perhaps because of the more yielding nature of the vessel walls. Almost as invariable is the jugular hum, or "bruit-de-diable," or "humming-top bruit," which can be heard over the jugular vein at its termination, often better over the right than the left vein. This murmur, when at all well marked, is invariably accompanied by a thrill. The bruit-de-diable is readily recognized by its continuous character, although its pitch rises with inspiration and falls with expiration. It is also louder when the patient is in the upright posture than when lying down. A similar venous hum may be heard occasionally on auscultation over the lateral sinus or the torcular Herophili. The order of appearance of the hæmic murmurs is usually as follows:—(1) The venous hum or the bruit-de-diable; (2) The systolic murmur in the pulmonary area (second left interspace); (3) A systolic murmur at the apex, indicating the occurrence of mitral reflux; (4) A similar murmur in the tricuspid area; (5) A systolic murmur in the aortic area. The murmur of mitral reflux is only present in advanced cases of chlorosis, and is usually the last to disappear when recovery is in progress. In well-marked cases of chlorosis there is slight œdema about the ankles which disappears after a night's rest, and perhaps slight puffiness of the lower eyelid. Perhaps the swelling of the optic disc occasionally found is really of dropsical origin. Marked neuro-retinitis has been met with in severe cases, but is very rare, nor are retinal hæmorrhages frequent (see ANÆMIA, PERNICIOUS). The pulse is rather quick, and often of comparatively high tension, which does not accord with the oligæmic view. On the other hand, it may be soft and compressible. The digestion may be deranged. Gastralgia is common, and the appetite variable. The writer is unable to confirm the statements made as to excessive capriciousness in this respect; generally there is more or less pronounced anorexia and discomfort after taking food. Vomiting is not common. Gastric ulcer is an occasional, but by no means frequent, complication. Constipation is the rule. The urine is copious, pale, and of low specific gravity, but is variable in this latter respect, some observers finding that there is excessive excretion of urea and uric acid, although pigmentary matters are deficient. Amenorrhœa is a frequent concomitant, and for the most part must be attributed to the anæmic

state. Lastly, there may be some pyrexia, especially in severe cases.

The *diagnosis* of chlorosis is easy, provided that a sufficiently elastic interpretation be placed upon the term. If sex and age concur, and if there be no evidence of any anæmiating disease (and the possibility of phthisis must be always borne in mind and carefully excluded), then the case may fairly be included under this head. But the difficulty arises in distinguishing this special form of anæmia and those forms which are more clearly traceable to conditions of life, from the grave form of idiopathic anæmia, which proceeds sooner or later to a fatal termination, particularly as cases which at their outset conform to all the characters of chlorosis may ultimately pass into progressive pernicious anæmia.

Treatment is hygienic, dietetic, and medicinal. The withdrawal of the patient from insanitary surroundings, and the exchange of a town life for a country life, are measures of a certain value, and show the influence which exclusion from sunshine and pure air has in the production of the disease. Exercise should at first be reduced to a minimum, rest in bed having an especially good effect, particularly upon the overworked milliner or domestic servant of town. Massage is useful, but seldom needed, recovery being often very rapid without recourse to it. The diet should be regulated, and, as soon as possible, meat should be given. An occasional aloetic purge may be necessary. For restoring the blood in cases of chlorosis there is no remedy equal to iron, which should be given in large doses. Blaud's pills, composed of the dried sulphate of iron (grs. ijss) and carbonate of potash (grs. ijss) with pulv. tragacanth (q.s.) (three, four, or five pills to be taken three times a day), are often all that is needed. Sir A. Clark, who attributes the anæmic state largely to the absorption of products of fæcal retention, thinks more value is to be attached to purgation than to tonics. It is, however, rarely necessary to administer a purgative with Blaud's pills. Iron in any form is useful, and, when the sulphate or perchloride are ill borne, the milder preparations, or ferruginous waters, as those of Schwalbach or Pyrmont, may be tried. Iron rarely fails to rapidly increase the hæmoglobin, but, when progress is slow, arsenic may be given, either in combination with, or in substitution for, iron. The mineral acids, especially hydrochloric,

are of considerable service when digestion is feeble. Cold baths, and sea bathing in moderation and with due precautions, are useful. Cases of chlorosis are specially liable to relapse if treatment be discontinued as soon as the colour returns to the cheeks; it is therefore essential that the treatment should be persevered with for a prolonged period and re-commenced on the first sign of a return of the condition.

SIDNEY COUPLAND.

CHOLERA is a generic term which has been somewhat loosely applied to a series of acute diseases, mainly characterized by copious intestinal flux; these are Asiatic Cholera, English Cholera (cholérine, cholera nostras), and Cholera Infantum.

CHOLERA ASIATICA is an acute specific disease, occurring in temperate climates as an epidemic only, and characterized by copious discharge of watery fluid from the alimentary canal, suppression of urine, and collapse.

The *symptoms* are divisible into three stages. The most prominent symptom of the *first stage* is the so-called "premonitory diarrhœa;" the stools are copious and watery, and the patient experiences great depression, epigastric sinking, and nausea. In severe attacks, and especially at the commencement of an epidemic, this stage may be absent, the patient becoming suddenly affected by symptoms characteristic of the *second stage*.

The stools are now very frequent, and the watery fluid passed ceases to be bile-stained, and becomes colourless or opalescent, with floating flocculi—the rice-water stools. Vomiting shortly becomes a prominent symptom, the contents of the stomach being first rejected, and then all the water which the patient, impelled by a violent thirst, is eager to drink; this is mixed with mucous and epithelial débris, so that the vomited matter much resembles the stools. Painful cramps in the muscles of the extremities and the abdomen ensue; the pulse becomes rapid (90 to 100) and progressively weaker, the respiration hurried, and the temperature in the mouth and axilla sub-normal; the patient, though prostrate, is restless, his voice husky, his face pinched, and the skin inelastic.

The second stage, which lasts from two to fifteen hours, gradually passes into the *third, algid, cold, or collapse stage*.

The purging and vomiting now either

cease or diminish, but the signs of prostration and imperfect aëration of the blood increase. The temperature in the mouth and axilla is 4° or 10° or even 20° F. below the normal, but the rectal (or vaginal) temperature generally ranges between 100° and 102° F., but may be as high as 108° F. in cases about to terminate fatally in this stage; the pulse is imperceptible at the wrist, and may also disappear from the brachial and carotid arteries; the first sound of the heart may be inaudible; respiration is very shallow and hurried. If a vein be opened, only a few drops of dark, viscid, "tarry" blood escape, and the imperfect circulation is evidenced by a leaden hue, especially marked in the extremities, face, and tongue. All the soft tissues of the body appear to shrink, the face becomes hollow, the eye-balls dry, sunken, and bloodshot, beneath half-closed lids. The skin is inelastic, often covered with clammy perspiration, and cold; the expired air also is cold. The excretion of urine and bile ceases, the voice is a whisper, and the patient, who is at once restless and apathetic, complains only of thirst, unless the cramps which are a prominent symptom of the second stage persist. Death may thus gradually be brought about after, on an average, twelve hours of the third stage. Occasionally the patient passes so rapidly into the collapse stage that diarrhoea does not occur, the whole duration of the illness being only a few hours.

If death do not take place in about twenty-four hours (more or less) *reaction* sets in. (1) This may be imperfect; if so, the patient becomes semi-comatose, the suppression of urine persists, the skin remains cold and clammy, but dusky-red instead of leaden. Though the pulse at the wrist becomes perceptible, respiration is still hurried, and death ensues in a few hours. (2) The reaction may be so little marked that the patient passes at once into convalescence by the mere cessation of symptoms and the reappearance of urine. This is of especial frequency in cases of cholera occurring in the Tropics. (3) Reaction may be well marked, and for ten or twelve days the symptoms may resemble those of enteric fever in the second week; the temperature is 2° or 3° above the normal, the pulse full and quick, the respirations are a little hurried, the face is flushed, the skin becomes red and hot, and may present an eruption (roseolar, or more rarely erythematous, urticarial, or vesicular). The stools, which are at first pale-yellow,

watery, and sometimes blood-stained, soon begin to contain bile, and have a pea-soup character, but are very fetid. The urine is scanty at first, and contains a very small proportion of the normal solids. In about half the cases it is albuminous, and it may contain casts. The tongue is dry and furred, and low muttering delirium is often present. Death during reaction may be preceded by cerebral symptoms (convulsions, coma), probably of uræmic origin; or it may be brought about by pulmonary engorgement and œdema, by gastro-enteritis, or by asthenia. Convalescence in more favourable cases may be delayed by subcutaneous abscesses, parotid suppuration, and sloughing of the cornea.

It is the duty of the physician in charge of a case of cholera to see that the stools and all soiled linen are thoroughly disinfected. This is best done with the solution of the perchloride of mercury (*see DISINFECTION*). Where cesspools are in use, the dejecta, after disinfection, should be buried in a deep pit, situated as far as possible from wells and streams.

The *diagnosis* of Asiatic cholera cannot be made by the presence of any pathognomonic symptom, as severe cases of simple cholera or choleraic diarrhoea may present all the symptoms of mild cases of Asiatic cholera. The history of the individual as to recent residence in an epidemic area, or the probability of the locality having become an epidemic area, are the most important elements in the diagnosis.

During the epidemic prevalence of cholera, cases of collapse from rupture of the stomach or intestine, and cases of internal strangulation and poisoning by arsenic have been mistaken for that disease. At such times it is prudent to treat every case of severe diarrhoea as a case of cholera, although the absence of the "cholera-voice" and the maintenance of a good pulse, together with the general aspect of the patient, may enable a physician with special experience of cholera epidemics to speak with confidence.

The early recognition of a commencing epidemic prevalence is a matter of the greatest importance; for this the individual practitioner must depend on a properly organized national and international health service, which will derive assistance from the bacteriological examination of stools from suspected cases. The discovery of the comma bacillus of Koch would afford weighty if not con-

clusive evidence of the real nature of the disease.

The rate of mortality varies from 10 or 20 to 66 per cent. of attacks in different epidemics, and is not less in temperate than in tropical climates; the average is stated at over 50 per cent. (Hirsch).

The *prognosis* is therefore always grave; the rate of mortality already obtaining during a given epidemic and the probability that the earliest cases observed in any locality will be the most severe must be taken into account. The early onset of the collapse stage is the most unfavourable sign; not more than one out of three patients in whom this stage is well established recover. During the second stage the condition of the pulse and heart is the best guide, early signs of cardiac failure, especially the disappearance of the radial pulse, being of very serious import. A high rectal temperature (104° F.) is also unfavourable. The more rapidly reaction is established the better is the prognosis. During the early period of the stage of reaction continued suppression of urine, high temperature, blood-stained stools, roseolar or other eruptions, and pulmonary complications are unfavourable signs. Cholera is more fatal in children, old people, and weakly persons than in robust adults. It is doubtful whether early treatment lessens the severity of an attack.

The *pathology* of cholera has been fiercely discussed by rival schools. It will be admitted that the disease has travelled into Europe on five occasions. In its first period of pandemic prevalence (1817-23) it passed from India through Persia, and first reached Astrachan in European Russia. In the second period (1826-37) it reached Russia by way both of Bokhara and of Persia; from Russia the disease spread to Germany and from Germany (Hamburg) to England (Sunderland) and thence to Ireland. Subsequently it was carried by Irish emigrants to Canada. In the third pandemic prevalence (1846-63) the disease again travelled by way both of Bokhara and Persia to Russia, from Russia to Germany, from Germany (Hamburg) to England (Hull), and again it was carried to the United States by emigrants. But in the fourth (1865-75) and fifth (1883-87) pandemic prevalence the disease reached Europe at the Mediterranean littoral by way of the Red Sea and Egypt; it also travelled on these occasions with very much greater rapidity. A more minute examination entirely confirms the impres-

sion thus gained that cholera follows lines of traffic. It is, however, not communicable directly from man to man, and can only become epidemic in places which present certain local conditions of atmosphere and soil. The disease ceases to spread or becomes extinct during a continuance of cold weather, and is favoured by a moist, but not saturated, state of the soil. It is most intimately related to water supply, but may be transmitted by milk (probably through added water) and possibly by other foods; persons residing in an epidemic area who do not drink water, or are careful to drink pure water only, generally escape, whilst those residing without the area who drink the water of the area may suffer. The purity of the water supply, the prompt isolation of imported cases, and disinfection of their discharges probably account for the recent immunity of Great Britain from this disease.

The *specific virus* is undoubtedly contained in the rice-water stools, probably in them alone; they are capable of rendering large bodies of water pathogenic, and their virulence increases for some hours or days after they have been passed. The conviction that the virus must be a living organism has led to the stools being very carefully searched, and numerous micro-organisms have been discovered. The only one to which any importance can be at present attached is the so-called "comma bacillus" of Koch. If it be granted that cholera is a specific disease due to the presence of an organized virus, it seems probable that the organism develops in the intestinal canal, as the "comma bacillus" is known to do. Some would attribute all the other symptoms to this draining away of fluid, the inspissation of the blood leading to retarded circulation, to arrest of urinary secretion, and so to excrementitious poisoning. Others, whose views have received confirmation by the discovery of ptomaines produced by the comma bacillus, believe that a chemical poison enters the blood, produces spasm of the arterioles, especially of the pulmonary arterioles, and so leads to local and general asphyxia. Upon this latter view the rice-water stools are a paralytic secretion due to inhibition of the abdominal sympathetic by the poison. Experimental section of all the nerves of the intestine produces a similar over-secretion of watery fluid.

The most distinctive *post-mortem appearances* observed when death takes place in the collapse stage are a shrunken, dry

state of the tissues, a swollen, injected condition of the gastro-intestinal mucous membrane, with detachment of the epithelium in flakes. Ecchymoses and a sticky state of the serous surfaces, distension of the right side of the heart and of the pulmonary artery, collapse of the lungs, which are also exsanguine, and an inspissated condition of the blood, are appearances commonly met with. Rigor mortis sets in early, and may cause curious post-mortem movements. The temperature usually rises after death. The detachment of the flakes of intestinal epithelium occurs post-mortem, but it is a matter of dispute whether the distension of the right side of the heart occurs before or after death.

Treatment.—The results of treatment are unsatisfactory. During periods of epidemic prevalence it is universally admitted that every case of diarrhoea should be treated as though it were the diarrhoea of the early stage of cholera, and many physicians with Indian experience believe that cholera may be thus aborted. The first indications are rest in bed and the withdrawal of all food and drink, the patient being only allowed to suck ice. Counter-irritation by a mustard poultice to the epigastrium, or a wet abdominal pack, made by placing a folded wet towel on the abdomen and swathing the body in dry towels, relieves the patient. In India the general practice is to give opium combined either with an astringent (*e.g.*, opium gr. j, plumbi acetatis gr. iv, dissolved in water, and repeated after each loose motion until three doses have been taken) or with a stimulant, or in combination with both a stimulant and an astringent. Calomel in a single dose of 2 to 5 or even 30 grains, followed by repeated doses of opium, has been recommended. Others, who regard the diarrhoea as eliminative, recommend evacuant treatment by castor oil in doses of half an ounce, frequently repeated. All are agreed that when collapse is threatened or has set in opium ought not to be given, and that during the second stage it does not check the colliquative diarrhoea—is, in fact, probably not absorbed, and that, if given during collapse, it may subsequently produce toxic symptoms if the stage of reaction be reached. Sulphuric acid lemonade (℥xv in ℥j) is grateful to the patient, if not useful. Cramp may be treated by hand-rubbing, by the hypodermic injection of small doses

of morphine cautiously given, or by inhalation of ether. In the collapse stage no drugs are of much avail; brandy, iced champagne, and diffusible stimulants are of doubtful advantage, but, if the diarrhoea have ceased, enemata of warm beef-tea and brandy may be given. A general bath at 98° to 104° F. relieves muscular cramp and the feeling of distress, and may be followed by sleep and recovery. The injection of warm saline fluid into a vein is followed by a remarkable improvement: the pulse improves, the patient regains his faculties, and is able to sit up; this amendment is usually of very short duration, but the treatment appears worthy of trial, and recoveries have taken place after a second injection. The fluids used have been—(1) Warm water containing phosphate of sodium and common salt, of each $\frac{1}{2}$ per cent.; (2) warm water (110° F.) containing common salt 60 grains, chloride of potassium 6 grains, phosphate of sodium 3 grains, carbonate of sodium 20 grains, and absolute alcohol 2 drachms, in 1 pint; (3) "artificial serum."

The treatment of the stage of reaction is chiefly that of the complications. Of these the most serious is a continuance of suppression of urine; for this the patient should drink freely (Oss every second hour); dry cups or a mustard plaster should be applied over the loins, and a mixture containing liq. ammon. acet. ℥ss, combined with tinct. digitalis ℥v-x, or even tinct. cantharidis ℥x, may be given every two or three hours, to six doses. Too much food should not be allowed during the stage of reaction. Iced milk, beef-tea, chicken-broth, and arrowroot may be administered in small quantities at short intervals. If vomiting be troublesome, beef-tea and brandy enemata may be given. In some cases, however, small quantities of solid food are retained by the stomach. Carbonate of sodium and chloride of sodium, given either with the food or in a mixture, will help to restore the salts of the blood.

Persons residing in a locality where cholera prevails ought to observe certain precautions: the water used for drinking should be boiled and filtered, or imported natural mineral waters should be drunk; all milk ought to be boiled; no food which has been in the room of a cholera patient should be used. Purgative and laxative remedies and fruit must be eschewed.

DAWSON WILLIAMS.

CHOLERA INFANTUM is an acute disorder attacking infants and young children, observed only in warm weather, and characterized by uncontrollable diarrhœa and collapse. It is closely allied to, if not identical with, cholera nostras, but is both more prevalent and more fatal. The onset of symptoms may be very sudden, the infant being seized with violent vomiting and purging, quickly followed by collapse. In other cases diarrhœa comes on gradually, often accompanied or preceded by drowsiness, then vomiting begins, and lastly collapse ensues.

When the disorder is fully established, the *symptoms* are—Vomiting, at first the contents of the stomach, then a watery fluid containing more or less bile; diarrhœa, the stools being at first feculent, thin, and offensive, but soon becoming watery, inoffensive, and almost like urine; prostration, sunken eyes, pinched features, flaccid abdomen, inelastic skin, and an extraordinary shrinking in size of the whole body. The tongue is at first clean, but later is coated with a thin fur, which eventually becomes dry and brown; thirst is constant, but even water is generally vomited; the pulse is rapid, and the internal temperature raised (to 104° or more), although the extremities are cold to the touch; the patient is restless, but drowsy. With pronounced symptoms such as these, the child generally passes into deep collapse, drowsiness increases, diarrhœa continues, vomiting ceases, the features become still more pinched and livid, the eyes half closed, and the temperature may rapidly fall below the normal. Death is generally preceded by coma. Convulsive phenomena, varying in intensity from clenching of the hands to well-marked general eclampsia, are almost always to be observed at some stage.

In favourable cases the rectal temperature falls, and the stools begin to be feculent; water is retained by the stomach; the diarrhœa gradually ceases, and finally nourishment can be taken.

The disease is, as a rule, of short duration; it may terminate fatally in less than a day; death usually occurs on the third day; convalescence is usually established, if at all, on the fifth day, or sooner.

The *diagnosis* depends upon the presence of uncontrollable vomiting and diarrhœa, intense thirst, rapid shrink-

ing of the whole body, copious serous stools, and early collapse.

The *prognosis* in a well-marked case is extremely grave; when collapse is established, death almost invariably ensues. Early cessation of vomiting, the appearance of feculent matter in the stools, or a fall in temperature are favourable symptoms.

The *morbid anatomy* is not very characteristic; there is evidence of catarrhal enteritis, with denudation of epithelium and enlargement of the solitary and agminated glands, follicular ulceration is frequent; nephritis (parenchymato-glomerular) is always to be found; catarrhal pneumonia is generally present, and there is cloudy swelling of the cells of the liver and other viscera. The stools, which are watery and almost invariably offensive, contain casein, and frequently also some serum albumen derived from the undigested milk.

The *ætiological conditions* appear to be the same for all forms of acute summer diarrhœa, whether observed in infants, children, or adults. The essential condition is a period of continued high temperature, during which the air temperature is never much below 60° F. A more exact parallel can be traced between the temperature of the earth at a depth of 4 feet and the epidemic prevalence of diarrhœa; this does not begin until the 4-foot earth thermometer touches 56° F., and the epidemic attains its maximum in the same week as the earth temperature reaches its highest point.

The conditions of town life, especially in the overcrowded dwellings of the poor, favour the disease, which attains its greatest virulence in closely built towns, where sanitation has been long neglected, and where a naturally loose and porous soil has become saturated with filth. Hand-fed infants suffer more than those at the breast, probably owing to decomposition or contamination of the milk.

The disease is probably in some way dependent on the activity of micro-organisms existing either in the soil or food, or in both, and there is reason to believe that it may be communicated by the emanations from the stools.

The *treatment* of this severe form of diarrhœa in infants is very unsatisfactory, the mortality of cases in which the symptoms are well developed being not less than 60 per cent. Milk should be withdrawn. If vomiting be marked,

only iced water should be given. Iced white wine whey, and chicken or veal broth, if retained by the stomach, constitute the best diet. Collapse must be combated by hot mustard baths (about 3j to the gallon), and brandy or ammonia in small and frequent doses. High fever and convulsions are indications for tepid baths (75° to 80° F.). Drugs by the mouth are generally rejected, and seldom produce much effect if retained. Among the drugs praised are mercury, in the form of the perchloride, gr. $\frac{1}{10}$, or grey powder gr. $\frac{1}{6}$ – $\frac{1}{2}$, or calomel gr. $\frac{1}{10}$ – $\frac{1}{2}$ (the latter combined with Dover's powder, gr. $\frac{1}{12}$). These should be frequently repeated at first. Nitrate of silver gr. $\frac{1}{12}$ – $\frac{1}{4}$; salicylate of lime (grs. iij–v every two hours at first) or salicylate of soda; naphthaline grs. iij–iv, resorcin gr. j, and other antiseptics may be tried. Hypodermic injection of morphine (by preference the sulphate), beginning with gr. $\frac{3}{16}$ in the earliest stage; bromide of potassium; enemata of ice-water, or of thin starch containing laudanum ℥ij and sulphate of copper gr. $\frac{1}{4}$; irrigation of the intestines with warm water containing nitrate of silver gr. j to 3j, and even irrigation of the stomach. When colic is severe in the early stage, one or two large doses of bismuth (grs. x), with Dover's powder, or in mixture with laudanum, are sometimes successful. After the stools have again become feculent, chalk and catechu will usually check persisting diarrhoea.

DAWSON WILLIAMS.

CHOLERA NOSTRAS (English Cholera) is an acute disease characterized by a copious watery intestinal flux and by collapse. It resembles Asiatic cholera in its general symptoms, but is of a much less severe type, has a very low mortality, does not spread as an epidemic, though it is often endemic, and frequently occurs sporadically. The disease is not well defined, and it is more than probable that the combination of symptoms to which the term is applied may be produced by more than one cause.

Symptoms.—In a typical case the patient is suddenly seized with nausea, perhaps ending in the rejection of the contents of the stomach, and speedily followed by purging, the stools at first being bile-stained. After a time the stools become less coloured, and finally consist of a watery fluid containing a little albumen. From the first there is a feeling of depression, with epigastric

sinking, which deepens into more or less severe collapse, in which the face is dusky and shrunken, the eyes sunk, the voice feeble, the pulse small and frequent, and the respiration hurried. The temperature quickly becomes subnormal. The severity of the symptoms varies very greatly, and a mild attack is not to be distinguished from one of ordinary diarrhoea, whilst a severe case may exactly resemble one of mild Asiatic cholera.

The *diagnosis* from Asiatic cholera rests mainly upon the absence of an epidemic of this disease, the general mildness of the symptoms, and the less marked collapse.

The *prognosis* is always favourable except in the case of old or enfeebled persons or very young children (see CHOLERA INFANTUM).

Etiology and Morbid Anatomy.—In fatal cases acute gastro-enteric catarrh has been observed. The symptoms appear to be due to the absorption from the intestinal tract of some poisonous material either ingested as such or produced there by micro-organisms. Finkler and Prior have described an organism nearly resembling, but not identical with, Koch's "comma bacillus" of cholera; other microbes have also been found in relation with cholera nostras, but none of these organisms have been proved to possess pathogenic properties.

Treatment.—The most important point in treatment is to withdraw all solid food and milk, allowing only iced barley-water and iced veal or chicken broth, and best of all iced water. The patient must remain in bed in a well-ventilated room. A mustard poultice or hot stupe should be applied to the abdomen; if there be much vomiting, it is better not to give drugs, and to allow only iced water, or lumps of ice. If much pain be present, laudanum ℥xv, with either the compound tincture of camphor 3j, or bismuth nitrate grs. x, may be given. Large doses of calomel (as much as a scruple) have been recommended in the early stage, but castor oil will generally be found as efficient. Prolonged diarrhoea may be checked by astringents, such as chalk and catechu, sulphuric acid (℥xij), and acetate of lead (grs. iij). Old, feeble, and very young patients often need free stimulation with brandy or iced champagne.

DAWSON WILLIAMS.

CHOREA (St. Vitus's Dance) is an affection characterized by spasmodic movements of the voluntary muscles.

Symptoms.—The onset is usually gradual, being preceded for some little time by failure of the general health. The child (for the patient is generally a child) becomes pale, excitable, restless, and fidgety, is clumsy with its hands, drops things, shrugs the shoulders, jerks the elbows, or has twitching movements of the fingers or face, from which latter it is often thought to be making grimaces. The gait is awkward—a sauntering, dawdling walk; sometimes one foot is turned in.

Such are the prominent features of the disease in a mild form. Parents and teachers are very apt to mistake the nature of the condition, and, believing the clumsiness to be due to want of care, try to break the child of the supposed habits by punishment, which only has the effect of making the condition worse.

Gradually the patient becomes more clumsy, fidgety, and helpless, and the face acquires a vacant imbecile look, which is very characteristic. When asked to put out the tongue, no notice seems at first to be taken of the request, but after a pause the tongue is suddenly protruded and as rapidly withdrawn. The speech becomes indistinct, partly from impaired power of articulation and partly from an aphasic condition; all degrees of this state up to complete speechlessness may be met with.

The action of the heart is often irregular, and in a considerable number of cases a systolic murmur is present, sometimes at the base only, and then presumably hæmic, but more often at the apex. Should a systolic murmur at the apex or base vary much from day to day, it may be hæmic in origin; but if well marked and persistent throughout the attack, it is almost certainly due to organic change. Presystolic or double apex murmurs in chorea are invariably the result of endocarditis.

In many cases, particularly in the early stage, one side of the body is more affected than the other, but it is most unusual for the affection to be limited to one side throughout the attack. Unilateral chorea has unfortunately been called "hemichorea," a name also used for a totally different condition which has absolutely nothing in common with chorea, and no little confusion has been caused thereby.

There may be at first no movements, but an apparent paralysis of one side of the body, a condition subsequently replaced by chorea. The movements of

chorea are distinguished from those occurring in any other form of nerve disorder by their non-rhythmical and purposeless character; the same muscles or groups of muscles never twitch twice in succession. As a rule, the movements cease during sleep, but in the worst cases the movements are incessant, and sleeplessness becomes a marked feature of the case. Such patients emaciate rapidly, and sores form on various parts of the body, either from injuries or friction, the result of the constant movement.

Incontinence of urine or fæces is almost unknown.

Death may occur from exhaustion and sleeplessness, or may be ushered in by delirium. Another cause of death is pericarditis, which may carry off the patient during the height of the disease or when the movements have practically ceased.

The *prognosis* in children is generally favourable, as the disease, when uncomplicated and left to itself, lasts as a rule from eight to ten weeks. In young adults the prognosis is not so good, the danger being especially great in those cases which seem to get well very rapidly, as maniacal or other grave symptoms may appear with great suddenness.

Complications.—Amongst the complications rheumatism is the most important; it may occur with or without endocarditis, or endocarditis may develop without articular rheumatism. Another rheumatic manifestation sometimes met with in cases of chorea consists in the formation of subcutaneous nodules in the fibrous tissues, especially in connection with bony prominences. They are most common about the patellæ or olecranon processes, the spinous processes of the vertebræ, and along the occipital ridge or on the frontal bone, but may be met with elsewhere, and have been observed in the abdominal wall. The nodules, which are fibrous in structure, come out in successive crops, are not as a rule tender, and gradually disappear. Nodules are more common in cases complicated by endocarditis.

An eruption, consisting of round, slightly raised red spots, which fade in the centre, enlarge and gradually disappear (circinate erythema), is not infrequently met with, and is also of rheumatic origin.

Post-mortem Appearances.—Endocarditis is almost always found, in the shape of a fringe of fibrinous beads along the free edge of the mitral valve; sometimes

the aortic cusps are also affected, less commonly the aortic alone. Pericarditis is often found, for, as already remarked, it is one of the causes of a fatal termination of the disease. In many cases the nervous centres have appeared to be healthy, but plugging of minute vessels in various parts has sometimes been found. Dr. Dickinson has described an appearance of dilatation of the medium-sized arteries and veins throughout the brain and spinal cord, also exudations and small hæmorrhages into the neighbouring tissues. It must be remembered, however, that it is only in the most severe cases that these changes have been found, and that, as in the very great majority recovery is complete, it is more probable that these changes are the effects rather than the causes of the disease.

Ætiology.—As no constant changes have been found in the nerve centres, chorea must be regarded as a functional disorder—a view supported by the fact, just stated, that recovery, when it occurs, is always complete, no permanent paralysis ever being left behind. It has been said that the affection sometimes becomes chronic, but such cases, when carefully examined, generally prove to be instances of repeated relapses, in which the intervals of freedom from movements have been overlooked. The frequent co-existence of endocarditis long ago led to the hypothesis that embolism of the arteries of the corpora striata was the cause of all the symptoms; but the extreme rarity of unilateral chorea, the fact that permanent blocking of large vessels is never met with, and the absence of embolism of other organs, are strong reasons for its rejection.

It has been suggested that in chorea there is a suspension of the acquired combined movements and a return to the purposeless, uncontrolled movements of infancy (at a period when the cortical centres are not fully developed)—*i.e.*, a functional disturbance of the cortex of the brain. The psychical and speech disturbances would fit in well with this view, but it is probable that other parts of the central nervous system besides the motor area are more or less affected.

Chorea is most common between the ages of five and fifteen, but is occasionally met with at an earlier age. It also occurs in young adults between eighteen and twenty-five. In children it is about three times as common in girls as in boys, and in adults, too, it is much commoner in women; in no inconsider-

able number of the latter it accompanies pregnancy. There is almost always some hereditary nervous predisposition in the family.

Many of the subjects of chorea have previously suffered from rheumatism; sometimes the chorea immediately follows an attack of rheumatism, especially when this is a sequela of scarlet fever. At other times only a family history of rheumatism can be obtained; other children have had it, or one of the parents. Endocarditis in the patient or in a member of his family may fairly be regarded as of rheumatic origin. But sometimes no evidence of rheumatism in the patient or his family can be obtained; even then it must not be assumed that the case is essentially non-rheumatic, for in children the articular manifestations of rheumatism are very slight, whilst the heart is quickly affected; and if the patient be kept under observation for several years it is almost certain that in a subsequent attack, or at some other time, evidence of rheumatism will be forthcoming. Inherited nervous excitability and rheumatic proclivity are both necessary for the development of chorea.

There are two exciting causes, apart from rheumatism, which demand attention. Fright or sudden emotion in a child predisposed to chorea is undoubtedly capable of inducing an attack. To be attributable to the fright, however, the chorea must have come on within a few hours after the mental shock. The other great exciting cause is over-pressure in schools. It is not only the dull children, who are being constantly worried by their teachers, who become the subjects of chorea, but quite as often, if not more so, the bright excitable precocious children, who are already learned out of proportion to their years, and who are ambitious of more knowledge.

It is probable also that insanitary surroundings and insufficient food have something to do with the causation, for chorea is far more common amongst the children of the poorer classes than those of the well-to-do.

It has been said that it may be due to imitation. Accounts of an epidemic of chorea in a school may be safely set down as instances of hysteria, but great authorities have declared that a child could become choreic merely from imitating another child with chorea. Such an occurrence is certainly extremely rare, and before this mode of origin is accepted in any given case it should be

shown that the child was not predisposed to chorea, and was not frightened by the movements of the affected child. Another point that might be urged against the imitation theory is the extreme rarity of the simultaneous occurrence of the disease in several members of a family. The possibility of chorea being acquired by imitation may be ignored in admitting a choreic child into a ward with other children.

Treatment.—Rest is the most essential feature of the treatment; the child should not be allowed to go to school, and great care should be taken to avoid excitement. In the mildest cases no further measures will be needed, but, if the gait be at all seriously affected, the patient must be kept in bed or on a sofa, and on no account be allowed to do any head work. The diet is always a matter of moment. As a rule, in the mildest cases meat may be allowed, but it must be pounded, as, owing to the involvement of the muscles of mastication, children are very apt to "bolt" their food. In more severe cases, milk, beef-tea, jelly, and milk puddings should constitute the main articles of diet. Stimulants are seldom called for, except in the most severe cases where there is great exhaustion and sleeplessness. If the movements be very violent, precautions must be taken to prevent the patient from being jerked out of bed, or wounding himself against the sides of his bed, and a chorea bed has been devised, consisting of a sort of box with deep, well-padded sides, in the bottom of which the patient's bed is made. In children, a better plan is to make a sort of hammock by fastening the sheets to the side of the cot, so that the child is suspended between them; there is then no risk of his doing himself any harm; but it is very seldom that the disease is so severe in a child as to call for this mode of treatment.

Of drugs, arsenic enjoys the greatest repute; the liquor arsenicalis may be given in 3-minim doses, to a child of six, three times a day, and the dose may be gradually increased till symptoms of poisoning appear, when it should be reduced, or the use of the drug suspended for a time. A child of ten years old will often be able to take 12 or 15 minims as a dose without ill effects. Conjunctivitis and vomiting are the principal warnings that the drug has been pushed too far. In some cases, after the continued use of arsenic in this way, patches of a more or less brown colour have been observed,

chiefly upon the neck. As soon as the disease is somewhat under control, it is advisable to reduce the quantity of arsenic. Iron is also useful, especially in the form of the syrup of the bromide; 10 minims three times a day being the dose for a child ten years of age.

Sulphate of zinc in increasing doses has also been much recommended; a grain may be given three times a day, and 1 grain added daily until a maximum of 25 grains is attained, when the dose should be diminished in like manner as it was increased. It is worthy of note that, when thus administered, sulphate of zinc does not produce any ill effects, as children taking the maximum dose have a good colour and look healthy.

In very severe cases morphine by the mouth or hypodermically may be required to ensure sleep, but, as a rule, chloral answers better. In adults a full dose of 20 grains may be followed, if necessary, by half the quantity in two hours, 5-grain doses being subsequently given every two hours until some impression is made upon the disease. Some very severe attacks have been completely cut short in two or three days in this way, but in other cases the plan has failed; in such, possibly, hyoscine might be of benefit. The administration of chloroform may be necessary, and without its aid it is sometimes difficult to feed the patient either with the stomach-pump or through a nasal tube. Cold douches and ice to the spine have been recommended, but their use is not as a rule attended with much benefit. In the chronic forms massage is often most useful. In severe cases the limbs may be protected by being wrapped in cotton-wool. Any rheumatic manifestation or complication would be treated on general principles.

JOHN ABERCROMBIE.

CHYLURIA is the name applied to a condition of the urine in which it presents the appearance of milk. It is believed to be due to the admixture of chyle and urine.

Characters.—The quantity of urine passed in twenty-four hours may be either normal or excessive—generally the latter. In colour it is white, milky, and faintly translucent, being much clearer after a period of fasting. When quite fresh it has a distinctly milky odour, and in most cases sets as a fragile jelly. After an interval, varying, according to different observers, from half an hour to

a few hours, the jelly liquefies, and the urine then consists of a creamy layer on the surface, a pinkish deposit, and an intervening thin whitish fluid. The deposit is sometimes very considerable, and of a distinct blood colour, so marked that a reddish tinge may be imparted to the whole fluid. The specific gravity, as in normal urine, generally varies inversely with the quantity, but it, like the reaction, has no special characters. The urine decomposes rapidly, and acquires a peculiarly fœtid odour.

Minute fat granules form the larger part of the microscopical appearances. With these are often found fibrin filaments and oval granular bodies (about four times the size of a red blood disc), which are probably immature ova of the *filaria sanguinis hominis*. Torulae, leucocytes, red blood discs, epithelium, urates, oxalates, and triple phosphates may also be found, but never renal casts. Larval *filariæ* are either present in considerable numbers or entirely absent. The chemical analyses of different specimens vary within such wide limits that the averages obtained from them have but little value. This is especially true of the fatty matter, which varies from 0.47 to 1.3 per cent. The other constituents show a more constant proportion—viz., albumin, about 1.4 per cent.; salts, 1 per cent.; extractives, including urea, 2 per cent. A trace of glucose is sometimes present. It will be noticed that the relative proportions of the different constituents are under no circumstances similar to those of normal chyle or lymph. The chylous character of the urine may altogether disappear for irregular periods.

Significance.—The majority of cases of chyluria are due to the presence of the *filaria sanguinis hominis*, and occur in those who have resided in tropical countries. The immature ova of this parasite are carried to and block the lymph streams in the glands or elsewhere. Anastomosing channels become distended, and a varicose condition of the lymph vessels has been found to obtain in many cases. From these vessels the contents may escape. When the lymphatics of the ureters and bladder are affected, and are thus filled with chyle, chyluria results. The post-mortem appearances in the bladder have often been described as normal; but the same may be affirmed of the stomachs of those who have died from hæmatemesis due to portal obstruction. The

absence of renal casts in the urine and of morbid appearances in the kidneys is said to disprove the occurrence of organic changes in these organs, but dilated channels in the neighbourhood of the renal tubules have been observed. Other evidence of the presence of the *filaria*, and also such symptoms as pain (lumbar, abdominal, or testicular) and dysuria, may be present. The red deposit so often found in chylous urine was formerly supposed to be due to hæmorrhage, but Manson has suggested that when the lymph becomes stationary in the vessels its development is continued beyond the stage ordinarily reached in the lymphatics; hence the occurrence of red cells and the red colour. The causes of the disease in Europeans who have never resided in the Tropics have not been determined. It may be due to the presence of other parasites, or to some unknown morbid condition producing a similar mechanical blocking of the lymphatics.

Treatment.—(1) *Prophylactic.*—The state of the drinking water must be carefully examined and its purity ensured.

(2) *Therapeutic.*—Gallic acid (5j–5ij per diem) internally and perchloride of iron as a vesical injection have been used, but not with much benefit. A tourniquet applied to the abdomen over the lumbo-sacral prominence is supposed, in a case of Dr. Dickinson's, to have produced its beneficial results by damaging the parent worm. (*Vide FILARIA SANGUINIS HOMINIS.*)

H. MONTAGUE MURRAY.

CINCHONISM is the name given to a group of nervous systems produced by the too long continued use of quinine or by an overdose of that drug. The first warning is usually a humming or buzzing noise in the ears, accompanied by more or less deafness; sometimes the deafness is almost complete, and persists after all other symptoms have passed off. Frontal or temporal headache is generally present, and may be very severe; giddiness is also a common symptom. Dimness of sight, though less constant than the affection of hearing, is tolerably common, and may amount to complete blindness; it is associated with pallor of the optic discs, narrowing of the branches of the retinal artery, and contraction of the fields of vision. There is also a tendency for the heart's action to be weakened, a fact that should be borne in mind in the treatment of such a case, and the patient warned against any sud-

den effort which might induce syncope. After very large doses collapse has been noticed.

An erythematous rash, limited to the lower extremities, has occasionally been noted as occurring after small doses of quinine.

To abandon the quinine is generally sufficient to effect a cure; carbonate of ammonia in 5-grain doses and stimulants may be administered internally if there be any tendency to collapse. The headache will be best treated by the use of cold applications locally and by the administration of saline purgatives.

CLAVUS.—An acute pain limited to a single spot in the head, and so called because the sufferer feels as if a nail were being driven in at the point affected. Clavus is generally associated with hysteria.

CLIMATE AND HEALTH RESORTS.—**Climate.**—In studying the climate of any country or district the following are the most important considerations:—The general geographical position of the locality, whether continental or insular, and its relation to larger or smaller seas or oceans; the peculiarities of its atmospheric conditions, and the composition and nature of its soil.

A rough subdivision may be made by classing the climates of all the regions between the Equator and the 35th parallel of latitude as "hot," all between the 35th and 55th as "temperate," and all between the 55th and the poles as "cold" climates. No sharply defined boundary line can be recognized between these subdivisions, and in some parts the characters of each, especially as regards temperature, may be extended much farther north or south than these lines would indicate.

It is a characteristic of all large continents that the climate is less equable than that of islands, owing to the varying relations to the influence of the neighbouring seas, the greatest inequality being observed at the greatest distance from the coast. The atmospheric conditions in like manner are greatly influenced by the proximity of seas and of mountain ranges, as regards relative moisture, purity of the air, and the prevalence of winds.

The nature of the surface soil, and more especially of the sub-soil, has a marked influence upon local climate in respect of the purity and the relative

dryness or moisture of the atmosphere.

The climate of the ocean is the most equable, and, if the sanitary arrangements of the vessel be complete, the purest of all. The ocean atmosphere is greatly charged with moisture and with certain gaseous materials, such as ozone, iodine, and bromine, which have a marked tonic effect upon the human organism, and in addition is free from the myriads of organic particles with which the air of continents or islands is loaded. When at sea in the latitude of the "hot" climates the sudden cooling of the air at sunset leads to a rapid deposit of atmospheric moisture upon all parts of the ship and its occupants, but the sensations of cold thus produced are far less than those due to a similar cause on shore, and hence are less to be dreaded by the invalid.

The effect of the ocean climate upon the human body in health or disease varies considerably according to the latitude and the peculiar features of each voyage. A voyage in a well-appointed sailing ship involves a very gradual transition from one kind of climate to another, and conduces to a dull and indolent habit of life, especially on the long voyages to Australia or New Zealand. In the fast steamships of the present day the transition takes place with surprising suddenness, and as a consequence the life of the traveller is more restless and active, the mind being either preparing for arrival at a new port or occupied with the departure from the old one. Under either set of conditions, however, a sea life involves a constant exposure to fresh, pure air and a complete freedom from many of the worries and cares of life on shore. It offers, indeed, the most perfect form of mental and bodily rest obtainable, provided that sea-sickness does not interfere with its enjoyment.

The principal voyages to be commended for purposes of restoring health are—(1) the Australian voyage round the Cape. This lasts, in a sailing ship, from seventy to ninety days, or sometimes longer, according to the weather experienced, and should be undertaken in the autumn, leaving England at the end of September or beginning of October.

Preparations must be made for cold as well as for hot weather, although the latter prevails over the greater part of the voyage. On nearing Australia, and especially after landing, the colder air and more marked contrasts of cold and heat must be guarded against. Risks of

catching cold, which on ship-board may be run with impunity, cannot be so lightly regarded on shore after a long voyage, and hence precaution both as regards clothing and ordinary habits must be observed. The same remark applies with equal force to diet, and the somewhat natural tendency to compensate for a long series of shortcomings on board ship by an injudicious surfeit as soon as the traveller gets on shore is very likely to be followed by the penalty of over-strained and disordered digestion.

Exercise is a very necessary feature of life on board ship, and its neglect is sure to lead to digestive disturbances, especially if, as is very often the case, the naturally increased appetite be allowed full satisfaction at each meal. It is desirable that the diet at sea should be plain in quality and moderate in quantity, and especially so when passing through the hot regions.

(2) The voyage to the Cape can only be undertaken with comfort in a steamship or a yacht. Leaving England at the end of September, the voyage will be fairly calm throughout, although there are possibilities of rough weather during the first few days out, and the last few when nearing the colony. The mail steamers call regularly at Madeira, and sometimes at St. Helena, and the voyage as a rule lasts about twenty-one days. The prevailing winds are south and south-east.

(3) The voyage to India presents fewer attractions from a health point of view owing to the extreme heat which may be experienced during part of the voyage; but it is the most generally interesting of all the long voyages. Much depends, however, upon the time of year at which it is undertaken. By leaving England early in October, a very pleasant journey may be expected, subject to the risks of rough weather in the Bay of Biscay, and sometimes in the Mediterranean, but the rest of the voyage will almost certainly be passed on an even keel. The return voyage should be made in March or April, and it is always advisable to delay the return to England till the end of May, as the cold winds of the English spring are especially trying to persons arriving from tropical regions. A few weeks may be spent in Egypt, Malta, or Southern Italy.

(4) The voyage to South America, if undertaken in the autumn, is fairly suitable for invalids. It must be borne in mind that the hot season in Rio de

Janeiro, Monte Video, and Buenos Ayres is our winter. The time occupied in getting to the latter port is about twenty-seven days from Southampton, and the service of steamships is excellent. The ports of call in South America—Pernambuco, Bahia, and Rio—are full of interest, and from the latter port excursions can be made into the interior, where the scenery is in many parts very beautiful. Sufficiently good accommodation is obtainable for any but the most pronounced invalids. The coast is hot, and a good deal subject to epidemics of yellow fever, but a few miles inland the temperature becomes cooler, the nights being very pleasant, and the dangers of fever to the ordinary traveller reduced to a minimum.

(5) The voyage to the West Indies, although full of interest to the traveller and sight-seer, is of less value from the point of view of health, as the time taken to reach St. Thomas from Southampton is rarely more than fourteen days, and the inter-insular voyages have to be made for the most part in small steamers, involving a good deal of change. The traveller should start in the winter months, as the summer heat is too great for Europeans in delicate health.

Island climates resemble those of the ocean in many respects, and particularly as regards their equability and the prevalence of steady winds. As health resorts their characters vary in different regions, and require special consideration. Of the islands nearest home, the Canaries and Madeira are easily accessible by steamers running between Liverpool and the West Coast of Africa. The Cape mail steamers also stop at Madeira every week, and at Grand Canary during the winter months.

The Canary Islands available for prolonged residence are the two central islands of the group, Teneriffe and Grand Canary. Santa Cruz is the chief town of the former, and Las Palmas of the latter, and both are now provided with good accommodation. Orotava, in Teneriffe, enjoys an almost perfect summer climate, and possesses a good hotel, open all the year round. A good hotel has also been established on the island of Palma. The climate of the islands is hotter, dryer, and less equable than that of Madeira, and is more subject to heavy tropical rains. The average number of rainy days, however, is very small, being at Orotava only about forty in the course of the year. The roads are good about Orotava and the Peak of Teneriffe, and

on the island of Palma the scenery is very beautiful. In other parts of the islands, however, it is rather tame. Outdoor amusements, of which there was formerly a great lack, are now rapidly increasing, but there is little or no shooting or fishing to be had. Mosquitoes are plentiful, and in some places in the Canaries the activity and voracity of the fleas present a real drawback to comfort, but with the introduction of more cleanly habits it is probable that this plague will be diminished. Communication between the several islands and with Madeira is now maintained by a good service of steamers. Spanish is the language of the Canaries.

Madeira, or rather its chief town, Funchal, has held its own as a sanatorium for many years. Its climate is equable, warm, and moderately moist, but the air is not bracing. The town of Funchal is built on a hillside, sloping down to the bay, and residence may thus be selected at any level above the sea. The town is protected from the prevalent winds, and is absolutely free from dust. The water-supply is good. There is much less of the chill at sundown than is usually experienced in such climates. The winter season begins in October; the rainy days are of the sub-tropical kind, heavy showers alternating with bright sunshine. The climate of other parts of the island is variable, and the weather often cold and stormy. The scenery of Madeira is very beautiful, but it can only be seen by travelling on foot or horseback or, as is the more common custom, in hammocks carried by relays of bearers, as there are no driving roads and no wheeled vehicles, and the paths near Funchal are rough and stony. Portuguese is the common language. The hotel accommodation in Funchal is exceedingly good, and there are always plenty of villas to be let for the season. Perhaps the greatest drawback to residence in Funchal is the large invalid population of various nationalities.

The dryer and more bracing air of Teneriffe is often more suitable to sufferers from pulmonary disorders, than the equable climate of Madeira, especially during the summer, and hence the seasons may be passed in either alternately.

The islands of Corsica and Sicily, like Madeira, derive their popularity as health resorts from the position of their chief towns. Ajaccio, at the head of a beautiful bay with a due south-west aspect, is well protected from the cold winds by the mountains to the north-

ward, and has a warm, moist winter climate, with no excessive range of daily temperature. The rainy days of the winter are usually about thirty-five. The scenery is fine, and the accommodation good. A new hotel has recently been opened. The town is fairly free from dust, and suits cases of chest disease when there is no tendency to active mischief, and is also excellent for certain cases of asthma. There is, however, but little accommodation for invalids, nor are there many English residents. Excellent shooting can generally be obtained in Corsica. Ajaccio is easily reached by regular steamers from Marseilles and Leghorn.

Palermo, one of the most beautifully situated of all the Mediterranean health resorts, possesses an equable winter climate, but is more moist and experiences more rainy days than most of the others. It is rather windy, but very free from dust. The Sirocco is sometimes felt during a part of the spring months, and the liability to changes of this kind and the excessive glare of the sun are the chief drawbacks to residence in the town. The climate appears to be beneficial to the more excitable types of phthisical invalids, but does not by any means suit those of bilious or phlegmatic habit. Hotel accommodation is exceptionally good at Palermo, and visitors may rely upon obtaining all ordinary comforts. The town is a good deal frequented by the English, both as visitors and residents. It is best reached by steamer from Naples.

Malta has nothing to recommend it as a health resort except the equability of its climate. As a naval station it has always a large proportion of visitors, and is hence attractive from a social point of view, but the island itself is dull and uninteresting, and the town of Valetta is by no means a pattern of hygienic arrangement.

Corfu, formerly one of the most favoured of winter residences, has now become less fashionable, owing perhaps to the inconstancy of its climate, which is moister, rather colder, and less equable than that of many other islands. It is very rainy during November and December. Hotel accommodation is good in the town of Corfu, although no special provision is made for invalids. Yachting is the principal amusement, and is remarkably cheap; good shooting is to be had in the neighbouring mountains of Albania. The spring climate is the best, but the island is liable to visits

from the Sirocco. High winds are often prevalent, and create much dust. Corfu is best reached by steamer from Brindisi.

The island of Capri, situated between the Bay of Naples and the Gulf of Salerno, presents one of the most perfect island climates, being very equable, fairly dry, and, although rather windy, well sheltered. The evening chill is much less felt than on the neighbouring mainland. The island is rather difficult to get at, and is approached either by open boat from Sorrento or else by one of the steamers from Naples, the voyage in either case being sometimes uncomfortable. The hotel accommodation is good, but there are no special arrangements made for the comfort of invalids, and hence none but those capable of getting about easily should select the island for residence.

The climate of the **sea-coast** stands next in importance from the therapeutic point of view. Two classes of coast climate may be recognized, having respectively a bracing or stimulant, and a soothing or sedative effect upon the human organism. In our own country the eastern shores are almost without exception of the former class, whilst the southern and western shores are more marked by the latter quality, although certain parts are more sedative and relaxing than others, owing to their peculiar natural features. The most striking characteristic of the climate of the British Isles, as a whole, is the constant liability to change, even within the space of a few hours. Except during a few weeks in the middle of summer and occasionally during the winter also, changes of barometric pressure and in the direction of winds may occur in the most irregular succession, rendering it wholly impossible to forecast the state of the weather for more than twenty-four hours in advance.

On the eastern coasts of Scotland, England, Wales, and Ireland the rainfall is about half that of the western coasts. Cold winds are, however, very prevalent during the early spring and late autumn.

The south coast, between Dover and Portsmouth, enjoys a rather higher mean temperature and as low a rainfall as any part of the east coast; but from Portsmouth to Start Point the rainfall is higher, and over Cornwall it is very much higher, than over the rest of the southern shores. The winds of the south and west are less keen, and there is a larger proportion of sun-

shine. The west of Scotland has a very moist climate during all but the hottest months of the year—a marked contrast to the dry and bracing atmosphere of the eastern counties. Wales, except upon the actual coast, has also a moist and variable climate. Ireland, like England and Scotland, is drier and more bracing on its eastern shores than on the west, the rainfall is rather less than that of either of the other British Isles, except in the province of Munster. The mean temperature ranges from 46° to 51° in all three countries, that of the western coast of Ireland, Wales, and Cornwall being higher than other parts of the kingdom.

Of the **sea-side Health Resorts** in this country almost all are frequented in the summer, the more bracing shores being the most popular. The following are the leading characteristics of those which are also available in the colder months, beginning with the Kentish towns nearest to London. The north coast of Kent, Herne Bay, Westgate, and Margate, are essentially bracing places, with strong sea-breezes. They are especially suitable to cases of scrofulous disease, and for convalescence after chronic illness or surgical operations. Ramsgate is milder and less exposed to wind, but is decidedly bracing in its effects. Dover, Folkestone, and Sandgate are cold in mid-winter, but pleasant in spring and autumn, and suit the early stages of phthisis and bronchial catarrh very fairly. Hastings has an equable, moderately dry climate, with abundant sunshine, and is comparatively free from fogs. It is most visited in winter, and is well suited for mild cases of phthisis and for convalescents. Eastbourne is more popular in summer, and is subject to much wind in spring. It is bracing, and has the advantage of being built a little inland as well as on the immediate coast. Cases of anæmia and ill-health after excessive town work do extremely well there, and phthisical patients find benefit during the summer months.

Brighton is especially tonic in its effects, and is most popular as a resort for recruiting after over-work or any debilitating illness. The Isle of Wight presents on its south coast the well-known Undercliff, on which the town of Ventnor is built. This is protected on its north, north-east and north-west sides by high cliffs, and is open

only to the sea on its southern aspect. The climate is fairly dry and very equable, and has a generally tonic effect, being especially suitable to cases of early phthisis, and to irritable conditions of the throat. Ventnor is visited in the early autumn and in the winter. It is hot during the summer months, but pleasant all the year round. Shanklin and Sandown, on the south-east side of the island, are moderately bracing, and especially suited for young children. Freshwater, on the south-western side, is more bracing than either, and gets a larger proportion of fresh sea breezes.

Bournemouth stands partly upon cliffs overlooking the sea and partly on the sides of a valley dividing the east from the west cliff. It has a great reputation as a winter resort, and is not too hot in summer, but its effects as a health resort depend in great measure upon the selection of the right spot for residence in each particular case. In some parts it is a good deal searched by cold winds, but in others it is protected by the large pine woods, which form one of the chief features of the place.

Sidmouth is quiet and sheltered, its climate closely resembling that of Ventnor.

Torquay presents several varieties of climate at the different elevations at which it is built, but it is for the most part damp and equable, with a large proportion of rainy days in the year. It is particularly suitable to elderly persons, to whom the soft and rather relaxing air is pleasant. Cases of chronic bronchitis and chronic phthisis with much catarrh are, as a rule, benefited. Irritable conditions of the pharynx also do well, so long as there is freedom from cold winds.

Penzance has a somewhat similar climate, but is subject to a still larger proportion of wet days.

Tenby, in South Wales, possesses a fairly warm winter climate.

Llandudno, in North Wales, is sometimes visited in the winter, but is subject to more cold wind and wet days than would seem to warrant the preference for it over the warmer and more equable places in the South of England.

France.—The average temperature is higher than that of the British Isles, the summer heat in the south averaging 80°. The winter temperature of the west and south coasts is much higher than that of any other part of the country,

and the climate is rather more equable. Central France is colder and very bleak in places. The south coast, especially about Marseilles is subject, during about half the year, to the north-west wind known as the Mistral—a clear cold current, generally most keen in the late afternoon, and often ceasing at night. It commonly produces clouds of dust, but is usually followed by a bright, unclouded sky. The average rainfall over the whole country is about 30 inches, except in the mountainous districts of the Pyrenees and Auvergne. Of the places on the coast of France available as health resorts, the principal are Biarritz, Arcachon, St. Jean de Luz on the west and Hyères, Grasse, Cannes, Mentone and Nice on the shore of the Mediterranean. Biarritz is popular as a winter residence for chronic invalids from November till March, but being subject to strong winds and a high degree of moisture it is not suitable to chronic lung disease. Its character as a health resort is defined as bracing and sedative. Arcachon also has the same effect upon the system. It is more protected from the prevalent winds, which, moreover, having to pass over a great inland arm of the sea, become more charged with watery vapour and marine exhalations. Like Bournemouth, Arcachon is particularly rich in pine woods. St. Jean de Luz has a climate allied to that of Biarritz, but is more protected from winds by the hills which surround it, and is hence suitable to some forms of chest disease.

The south coast of France enjoys a very large proportion of sunshine throughout the year. Coupled with this, however, are certain drawbacks. The whole of the coast is subject to searching winds during the spring months, especially to the Mistral already referred to, and the north-east wind or "Greco." A hot wind from the south-east is also felt and is a part of the Sirocco to which the South of Italy is exposed. The day temperature of most of the health resorts of the Western Riviera is not very high in the shade, but may rise excessively in the sun. At sundown there is a sudden and uniform fall of temperature, always trying, and sometimes disastrous, to invalids. This is generally followed by a slight rise after the lapse of an hour. The annual rainfall is considerable, but the number of rainy days is not great, nor is the air moist as a rule. The winter climate, of the Riviera must not therefore be looked upon as by

any means perfect, or as fulfilling all the requirements of invalids during the cold season, but it is as a whole a great deal better than most varieties of winter climate to be met with in the British Isles. Hyères lies about three miles from the actual shore in a spot protected from the north, south, and north-east, but exposed on its western side, and it feels the force of the Mistral excessively during March and February. The climate of the place as a whole is a little more equable than that of the actual coast itself, the extremes of heat and cold being less felt. Costabelle, close to Hyères, is more sheltered on all sides and is admirably suited for winter residence. Cannes is the favourite resort of the English colony on the Riviera. It faces to the southward, and extends inwards for a considerable distance from the shore, the ground as it gradually rises to the lower hills being dotted over with villas. The climate varies in different parts of the district, but is bracing and stimulating as a whole, and hence is suitable to anæmic persons or those with scrofulous affections, but does not benefit the nervous, irritable, or inflammatory types of disease. There is not much shelter from the winds, and a great deal of dust is encountered at times. Local advice is necessary in selecting a residence for convalescents.

Mentone is very well sheltered, especially in its east bay, which is still and warm. It is well suited for old people and for the more irritable forms of lung disease, but not for cases of hæmorrhagic phthisis. The place is generally quieter in respect to social gaieties than some of the other popular resorts, and has sometimes been described as "dull."

Nice retains great popularity as a winter residence, chiefly on account of its gaiety and social attractions. Its climate does not present any special advantages over some of the less known resorts. It is generally bracing, but not very equable. San Remo, although on the Italian side of the frontier, may be classed with the other health resorts of the Western Riviera. Its climate is equable and moderately bracing, and its situation sufficiently sheltered. It is well suited to the irritable and nervous types of cases.

Algiers possesses a pleasant winter climate, subject to a good deal of variation in different years. As a whole, the climate is hot and dry, but not excessively so. The rainfall is considerable, and the number of rainy days somewhat higher

than in other places at the same latitude. The rain comes in heavy showers, and the ground dries rapidly. Cold winds may be felt occasionally, but they are less easily borne here than elsewhere, owing to the contrast with the prevailing warmth. The Sirocco blows but rarely. The temperature is apt to fall suddenly at sundown, but the nights, as a rule, are mild and balmy. The town itself is divided into a French and a native quarter, the former being nearest to the sea. The sanitary arrangements are defective in both quarters, and the suburbs are best fitted for alien residence. Mustapha, situated on rising ground to the south-west, is the most popular. Villas are plentiful, but care is necessary in selecting a residence to see that the living rooms are well exposed to the sun, and that the sanitary arrangements are satisfactory. This suburb is said to be as well suited for summer as for winter residence.

Hammam R'lhra, an ancient bath known to the Romans, and situated about sixty miles from Algiers, offers attractions during the months of April and March, but the statistics of its average climate are not especially inviting. It is on high ground, 2000 feet above the sea. Hotel accommodation is good, and sport can be obtained. Close attention to the rules of hygiene, both as regards residence, habits, and food, are essential in Algiers.

Egypt has an exceedingly dry, but inequable, climate, except in the neighbourhood of the Delta, and hence Alexandria and the northern towns are not suitable as health resorts. Cairo is popular from its social comforts and advantages, but is not much to be commended to invalids. Although close to the Desert, it does not reap the advantage of desert air, and is much subject to dust. The sanitary arrangements are very defective. Helwan, in the vicinity of Cairo, and in the Desert proper, is now becoming more popular than the city, but the true Desert climate is best enjoyed by means of the Nile voyage. Eight hundred miles of the river are available before the Second Cataract is reached. There is good accommodation at Assouan and Luxor. From January to March is the best period of the year. The climate as a whole is intensely dry, and the nights are frequently cold, necessitating the precaution of warm clothing. The Desert air is as pure as that of the ocean, and is bracing and invigorating. There are no very great extremes of

temperature, but the fall at sundown has to be constantly borne in mind. The climate is very suitable for quiescent cases of phthisis and for old-standing cases of bronchitis, with much emphysema. Catarrhal conditions and dyspepsia reap considerable benefit, but the more irritable class of cases, with febrile or hæmorrhagic tendencies, are not much improved.

Mountain Climates have been much employed of late years for the treatment of the various stages of pulmonary phthisis. Their common characteristics are, rarefaction of the atmospheric air, with consequent diathermancy for the sun's rays, and purity and freedom from organic particles; clear skies, with abundant sunshine, and a fairly uniform low temperature in the shade. The effect upon the human organism is essentially bracing, the altered density of the air leads to increased respiratory movements and a more thorough interchange of gases. Appetite is increased, and all the functions of the body appear to be stimulated, always provided that the powers of the lungs, and more particularly of the heart, have not been reduced below a certain level by previous disease or overwork. The principal Swiss altitudes, Davos, Wiesen, Maloja, and St. Moritz are all excellently supplied with hotel accommodation of the best kind, and at most of them there is no lack of interest and amusement. Davos-Platz lies 5352 feet above the sea-level, and is available as a residence all the year round. It is especially visited in the late summer and winter and spring by persons in the early stages of phthisis, and hence contains a large preponderance of invalids among its inhabitants. The climate is fairly equable, but may vary considerably in different seasons. The relative amount of sunshine is high and the solar radiation is great, although the thermometer may be below the freezing point in the shade. The amount of wind is moderate, and is less in winter than in summer. Davos, however, is becoming subject to the common evils of overcrowding, and the food supply is capable of much improvement. St. Moritz, in the Upper Engadine, lies 5803 feet above the sea-level, and possesses a dry, warm climate during the summer months from June till September, when it is chiefly frequented. The nights are cool, and the prevalent valley winds are moderate. The village of St. Moritz stands higher, and at some little distance from the hydropathic establishments around which

the best hotels are congregated. These latter are not open during the winter months, but good accommodation is available in the village itself. Wiesen lies at a lower level than Davos, and is often used as a halting-place on the return journey. It stands at an elevation of 4770 feet, and its situation is dry, sheltered, and sunny, and although less frequented than Davos-Platz, it possesses most of its climatic advantages. The Maloja, in like manner, may be visited as a halting-place in the descent from St. Moritz, but it possesses special features which entitle it to rank in the first class of mountain health resorts. The accommodation recently provided has rendered it most suitable for winter residence. It is not overcrowded, and is subject to a good deal more wind than Davos-Platz. The latter is not by any means a drawback, and in some respects is a distinct hygienic gain, as preventing the possibility of stagnation of air or smoke. E. CLIFFORD BEALE.

CLITORIS, Diseases of the.—This organ may be **absent** or **malformed**, such conditions being usually associated with other malformations. **Hypertrophy** of the clitoris is met with, and is often associated with hypertrophy of the labia minora. It occurs as a racial peculiarity in Hottentots, forming the so-called "apron." It is less common in cold countries than in the tropical zones. Venereal excesses are supposed to favour its occurrence. Removal of the clitoris has been practised for the purpose of curing the habit of masturbation, but there is no trustworthy evidence that the operation has any effect upon the patient's condition or habits other than, considered as a mutilation, a harmful one. But should the clitoris be so large as to cause annoyance to the patient, its removal will be the only treatment. Hypertrophy differs from elephantiasis in that the clitoris remains of its natural shape, and the parts from which it springs are healthy.

Elephantiasis of the clitoris is often associated with similar disease of the labia. Together they may form a mass weighing as much as 20 lbs. It is an overgrowth of the sub-mucous connective tissue, associated with dilatation of the lymphatics and veins, thickening of the skin and mucous membranes, and an irregular warty polypoid overgrowth.

The *pathology* of elephantiasis will be considered elsewhere. It is rare except in

tropical countries. It occurs during the years of sexual activity. Instances of its transmission by inheritance have been described, but these perhaps should more properly have been called hypertrophy (see *FILARIA SANGUINIS HOMINIS*).

Ætiology.—Its causes (other than the presence of parasites) may be generalized as those of chronic inflammation, together with pruritus, injury, erysipelas, syphilis, gonorrhœa, excessive sexual excitement, and eczema. Pregnancy usually augments the growth. From the dependent position of the growth it is very liable to venous congestion, œdema, and ulceration.

Treatment.—Removal is the only cure.

Cancer occasionally affects the clitoris. It usually begins at the tip, and presents itself as a bright-red, hard, warty, ulcerated swelling, at first movable, having a narrow base of healthy tissue. In time the inguinal glands become affected. It should be treated by prompt excision.

Removal of the clitoris is best effected by cutting with the platinum knife of the Paquelin thermo-cautery, as the part is very vascular.

G. E. HERMAN.

CLONIC.—Spasms are called clonic when they intermit at short intervals, during which the muscles are in a state of relaxation. Clonic spasms succeed the tonic spasm of the first stage of an epileptic fit.

COAL GAS, Poisoning by.—This may occur in a variety of ways, but it commonly arises from an escape of gas into a room owing to faulty pipes or joints, or from carelessness in turning off. When the leak is underground and the gas permeates the soil before gaining access to the room, symptoms resembling those of typhoid fever are apt to be produced, headache and malaise being the most prominent. When the escape of gas takes place into a bedroom during the night, the occupant may pass into a state of insensibility without being aroused.

Dullness or stupor, passing on to coma, is the earliest symptom; the face becomes livid, the respirations shallow, the pulse feeble, the conjunctivæ suffused, and convulsions sometimes occur—a symptom of unfavourable omen. With regard to the pupils there is nothing characteristic. Vomiting is not uncommon, and the breath and vomited matters may smell of the gas.

If the person be not speedily removed from the impregnated atmosphere death is certain to follow, and even after removal it may happen unless active treatment be promptly adopted.

Treatment.—A free current of fresh air and artificial respiration should be first tried; brandy should be administered if the action of the heart be weak, and if there be much lividity the patient should be bled. Relapses are very common after improvement has commenced, and constant vigilance is therefore needed.

COCCYGODYNIA means pain in the coccyx. It occurs almost exclusively in women who have had children, and is usually dated from a confinement. The conclusion follows that it is, as a rule, due to injury during delivery; to overstretching or rupture of the ligaments uniting the coccyx to other bones, or to periostitis, dislocation or fracture of the coccyx. It is sometimes referred to accidental injury, or to excessive horse exercise.

Sometimes the presence of a fracture or dislocation, or of inflammation, can be ascertained by the signs indicating these conditions, but generally there is nothing to be perceived except that the patient points to the coccyx as the seat of pain, and pain is produced by pressure on, or movement of, this bone. The patient therefore often cannot sit comfortably, and defæcation is painful. Sometimes the coccygeal pain is merely part of a general pelvic pain, due to some morbid condition within the pelvis.

Treatment.—General tonic treatment (quinine, iron, and nux vomica) should be tried, in the first instance, together with rest and an aperient to ensure a daily soft evacuation of the bowels (mag. sulph. ʒj, vini aloes ʒj, in water every morning). In the majority of cases this will in time cure the patient. Should the pain be very severe, morphine may be injected subcutaneously over the coccyx. If there be a dislocation or fracture of the coccyx, causing it to be fixed in an abnormal position and so painfully press upon the integuments, the best plan will be to remove it altogether. In cases in which pain on moving the coccyx has been very persistent and other treatment has failed, good results have been reported from the subcutaneous division of the ligaments, muscles and fasciæ attached to the bone.

G. E. HERMAN.

COLD, Effects of.—The first effect of cold applied to the living body is to produce some congestion of the superficial blood-vessels; this is quickly followed by their rapid and extreme contraction. To this, in the healthy and robust, and provided the exposure to cold has been but moderate, the period of reaction succeeds, and is indicated by the ruddy appearance of the surface resulting from the re-dilatation of the capillaries and the augmented energy of the circulation. If the exposure to even a moderately low temperature be prolonged, and after but a short exposure to severe cold, especially in the case of the weakly and debilitated, no reactionary glow ensues, but a lengthened period of vital depression, which is accompanied by enfeebled nutrition, and followed by tedious recovery. The exposure may be so prolonged, or the cold so intense, as to induce not merely local and temporary vascular syncope, but local, or even absolute and general, physiological death; beyond this point the physical and chemical effects only of cold continue in force. Complete (physical) freezing of a tissue is never followed by recovery of the part.

The immediate and ultimate effects of cold are dependent upon—(1) The condition of the individual; the feeble, the aged, the young, the intoxicated, and those not previously enured to exposure succumb with comparative rapidity; (2) the method of its application—*e.g.*, water and moist air are good conductors of heat, and thus chill rapidly; heat is also quickly abstracted by the convection of strong winds, while exposure to *still* air at a remarkably low temperature can be borne with comparative impunity; (3) the area of the surface exposed; (4) the part of the body exposed—*e.g.*, outlying portions, such as the toes, fingers, the extremity of the nose, and the tips of the ears, where the circulation is most easily checked and less readily restored, not uncommonly suffer local death from “frost-bite” without any great disturbance of the general health, whereas prolonged application of but moderate cold to the head or the abdomen has been productive of fatal results.

The *local effects of cold* upon the tissues are illustrated by CHILBLAINS, FROST-BITE (*q.v.*), and gangrene (*see* DERMATITIS GANGRENOSA).

Dying from cold is attended with shivering, pallor, and lividity, puckering of the skin, increasing muscular stiffness and weakness, confusion of the senses,

profound unconsciousness; there may also be, for a while, intense thirst, obstinate insomnia, and almost every symptom, subjective and objective, of cerebral disturbance; and in such instances the symptoms may be, and have been, mistakenly ascribed to the effects of alcohol. Death ultimately results from shock, syncope, coma, or asphyxia; or, as in most cases, from various combinations of these conditions.

The *post-mortem appearances* in cases of death from cold are mainly a waxy anæmia of the surface, varied by bright-red patches on the more exposed parts of the body, and a corresponding congestion of internal organs, with extreme rigor mortis, very marked contraction of the external genitals, and over-distension of the bladder. The reddish-brown stains corresponding to the course of superficial blood-vessels are not pathognomonic of death from cold, but are a post-mortem change due to the physical effect of cold in disintegrating the blood-cells, and the subsequent diffusion of their colouring matter through the vascular walls.

Treatment.—The treatment demanded by cases of exposure to cold, whether the exposure have been moderate or severe, and whether the whole body or only a part have suffered, consists essentially in the *gradual* application of external warmth, and the equally gradual but effective restoration of the natural heat-producing power of the organism; and, as a broad rule, the less severe the exposure, the more quickly and energetically may artificial warmth be employed. In extreme cases, the sufferer should be promptly stripped of his clothing, wrapped in blankets or other woollen coverings, and placed in still, dry, cold air, as in a cold, empty room, the temperature of which is to be gradually raised as recovery proceeds. The surface should be stimulated by gentle friction, at first with snow or ice, and later with dry flannel or with the hands.

When practicable, the whole body may be at once immersed in a bath of ice-cold water, to which warm water is gradually added from time to time, while continuous hand-friction of the limbs and trunk is maintained. The bladder, if found to be distended, must be emptied by the catheter. So soon as the power of swallowing is restored, small quantities of warm fluids, such as tea, coffee, and beef-tea, may be administered; later on (but on no account at first), small quantities of wine or spirit, well diluted with warm water, may be given.

As consciousness returns, the sufferer may be placed in bed between the blankets, and the temperature of the room gradually raised. When the natural body-heat has been re-established, a nutritive enemata may be administered and a disposition to sleep encouraged. Serious cases are often followed, under the most favourable circumstances, by a tedious recovery; and rest, careful nourishment, and tonics are needed for a long time. In every case of extreme exposure the remedial measures indicated above should be resorted to with all possible expedition, and they should be steadily persevered in for a long time, however hopeless the restoration of vitality may at first appear.

As a *cause of disease*, immediate and remote, exposure to cold, and pre-eminently to damp cold, forms a most important factor in the death rate of this as of other countries with a temperate climate. There is scarcely any disease to which cold may not act as a potent predisposing cause; there is probably none whose severity is not aggravated by exposure, or in the course of which exposure to cold is not liable to set up intercurrent complications which the already enfeebled vitality of the patient may be powerless to resist.

C. E. SHELLY.

COLD, Therapeutics of.—As a therapeutic agent, cold commands an extensive field, and subserves various ends. These will be best appreciated by remembering that what is commonly called the "application of cold" is really the incidence of a sudden and transient physiological stimulus *plus* the physical "abstraction of heat," and that this latter may be slight or extreme, rapid or slow, limited and local or general and extensive, momentary, repeated, or continuous. The method employed, the area affected, and the duration of the process are the factors which chiefly determine the character of both the immediate and ultimate results.

The general effect of applying a good conductor at a low temperature to any part of the living body is to lower the temperature, to contract the blood-vessels, to diminish the nervous sensibility, and to lessen the bulk of the part. If the application be only temporary, its withdrawal may be followed by the restoration and local increase of vital activity, known as "reaction" (see COLD, EFFECTS OF). But if the application be longer continued, its physiological effects may

persist, and even continue to increase, after it has been withdrawn. Hence cold acts, both generally and locally, as an *antipyretic*; when moderate in degree, and followed by reaction, as a *tonic* and *stimulant*; it first excites, and finally abolishes, reflex action; it acts as a *sedative* to the vascular, cardiac, and nervous systems; as an *anodyne* and, in a more extreme degree, as an *anæsthetic*; locally as an *anaphrodisiac*; and when the system is under its influence the action of drugs is less rapid, less marked, and more uncertain.

The various methods of applying cold may now be briefly considered.

Affusion.—Cold affusion consists in the sudden application of a considerable volume of cold water to the whole or to some part of the body. It may be used in several forms. In the collapse sometimes observed in cases of high fever, where pulse and respiration fail, and the surface becomes cold although the internal temperature (as taken in the rectum) continues abnormally high, two or three gallons of water at 50° Fahr. may be poured over the patient, beneath whom a waterproof sheet has previously been placed; energetic reflex action is thus excited, the cardiac and respiratory functions are restored, the surface becomes warm, and the temperature in the rectum falls.

A stream of cold water may be similarly applied to the head of a robust child suffering from convulsions; to the throat and upper part of the chest during laryngeal spasm; to the head and neck in cases of sun-stroke, except when the skin is cold and clammy, with other evidences of greatly depressed vitality. Its powerful reflex action as a respiratory excitant makes the cold douche valuable in cases of threatened death from narcotic poisoning (*e.g.*, chloroform, opium, alcohol); and in like manner it has been found serviceable in exciting contraction of the uterus, the bowels, and the urinary bladder.

In hysteria and chorea and allied affections of the nervous system the cold douche and the shower-bath exert both a calmative and, by their tonic after-effects, a curative effect.

The cold douche is absolutely contraindicated in all cases of extreme weakness with feeble pulse, low muttering delirium, and cool, clammy skin.

Anæsthetic Uses of Cold.—Small superficial operations—such as the opening of abscesses, the insertion of sutures, and the removal of small tumours—may be

performed without pain upon parts which have been previously "frozen" by the application of a freezing mixture (salt and ice or snow, equal parts), or—more conveniently—by the ether spray. But the thawing of frozen tissues is apt to be attended with pain; and the value of this method of securing local anaesthesia has been greatly lessened since the discovery of cocaine.

Anodyne Effects of Cold.—The pain of inflamed surfaces, bruises, commencing abscesses, strained joints, &c., is often greatly relieved by the continuous application of cold. But in many instances experiment alone can decide whether cold or moist heat, in the form of a poultice, will be most comforting to the patient.

Baths.—For the methods and uses of the cold bath, see BATHS.

Compresses.—Two or three folds of absorbent material wrung out of iced water may be applied with benefit over painful regions—*e.g.*, to an inflamed throat, a bruised limb, &c. They must be applied directly to the skin, and should be frequently renewed—about every five minutes—in order to be really effective. If covered with oiled silk, and allowed to remain *in situ*, they soon act as tepid poultices.

Dry cold is usually applied by means of an india-rubber bag, or a bladder, filled with ice or snow, or a "freezing mixture." Ammonic chloride and potassic nitrate, of each 5 parts, mixed with 10 parts of water, will cause the thermometer to fall from 50° to 10° Fahr.; ammonic nitrate 1 part, snow 2 parts, and water 1 part will produce a reduction from 50° to 40° Fahr.; 2 parts of snow to 1 part common salt causes a fall from 32° to 4° Fahr.; and 5 parts of ammonic nitrate with 5 of common salt and 12 of snow or ice causes the mercury to sink from 18° above freezing point to 25° below it.

If a bladder be used, a fold of lint or flannel should be interposed between it and the skin, lest heat be too rapidly abstracted. When an ice-bag or ice-cap is applied to the head it should be suspended by means of a cord, so that it may not press unduly upon the part. Cold in this form has been applied with advantage for many hours and even days at a time, in cases of fracture, and in commencing vertebral caries, also to the eye after operations, to an inflamed testicle, over the ovarian region, to the throat in diphtheria, and to the shaven scalp in cases of meningeal and cerebral inflammation.

Dry cold is conveniently applied to many situations by means of Lieter's apparatus—in which cold water continuously circulates through the closely approximated bends of a small metal tube, which is sufficiently pliable to allow of the whole apparatus being moulded to the contour of the part on which it lies.

Douche—see *Affusion*, (*supra*).

Irrigation is a simple, ready, and valuable method of applying moderate cold continuously and without disturbance of the part to inflamed and injured joints, severe bruises, &c. Above the injured part a vessel containing cold water is fixed; some threads of worsted, or a piece of lamp-wick, well wetted, are so placed that while one end reaches to the bottom of the vessel, the other—and longer portion—falls over the edge and side of the vessel so as to siphon the water, drop by drop, on to the desired spot, whence it is conducted to a rubber sheet suitably disposed beneath the limb. The fluid may, of course, be variously medicated if so desired, and, by allowing it to flow through a tube from a reservoir of sufficient capacity, the rapidity with which heat is abstracted and the extent to which the part is "flushed" by the stream will both be increased. Injured joints have thus been irrigated with antiseptic solutions for weeks together, and with good results.

Injection.—Ice-cold water may be injected into the vagina or the rectum in order to stop severe hæmorrhage, but it appears to be less efficacious than very hot water. The practice of injecting a few drachms of cold water into the rectum after each action of the bowels affords much relief, and exerts a locally tonic and astringent action in cases of bleeding hæmorrhoids.

Lotions.—Cooling and evaporating lotions are applied to relieve local heat, pain, and swelling, and their influence tends to promote the absorption of extravasated blood. They are best applied by means of a single thickness of lint or rag saturated with the lotion and applied directly to the skin of the part. As soon as the lint begins to get dry or warm it should be removed, and another similar piece applied in its place; the greater the facilities afforded for evaporation from the lint, the more marked will be the cooling effect. In addition to cold water or vinegar and water, the following are effective cooling lotions:—Spirits of wine, or eau de Cologne (or other scent), and water; sp. vin.

rect. ʒvij in 1 pint of water; or the same with the addition of 5 or 6 drachms of potassic nitrate or ammoniac chloride; and ammoniac chloride ʒv, acid. acet. dil. ʒv, sp. vin. rect. ʒv, in 1 pint of water.

Pack.—The cold pack is a useful means of reducing the body temperature in cases of hyperpyrexia, or when, with high fever, violent delirium, much restlessness, and a hot, dry skin are present; but it is less efficacious than the cold bath. The patient is wrapped in a sheet previously wrung out of cold water; as the sheet becomes warm, it is replaced by a fresh cold one, or iced water may be squeezed over it from a sponge, or lumps of ice placed upon and around it. When the body temperature has been sufficiently reduced—or immediately on the appearance of any signs of collapse—the wet sheet should be removed, and replaced by a light covering, but not by a blanket.

In less severe cases the temperature may be appreciably reduced, and much comfort afforded to the patient, by repeatedly and regularly sponging the surface of the body with cold water, or toilet vinegar and water.

In addition to the several methods of applying cold externally, chips of ice slowly swallowed are often valuable in relieving inflamed conditions of the mouth and fauces and also in the treatment of nausea and irritability of the stomach. C. E. SHELLY.

COLIC, INTESTINAL.—Painful, irregular and spasmodic contraction of the intestine (not necessarily of the *colon*), unattended with fever.

Symptoms.—In a typical case the patient complains of severe—sometimes agonizing—paroxysmal pain of a twisting, gripping character, commonly at the outset referred to the region of the navel, and thence spreading to other parts of the abdomen. The belly is usually distended (except in **LEAD COLIC**, *q.v.*), but its muscles are subject to irregular contractions, and the varying outline of coils of distended and contracting intestine is visible through the abdominal walls. The pain is relieved by steady pressure and, temporarily at least, by the expulsion of flatus or feces. There is a general pallor and coldness of the surface and extremities, without pyrexia or increase in the rate of the pulse, which may even become feeble and slow. There may also be vomiting and diarrhoea, and severe cases are attended with great suffering and depression.

On the removal of the cause of the attack (*e.g.*, the expulsion of irritating ingesta) the paroxysmal pain usually gives place to some sense of general abdominal soreness; but occasionally it remains for some time unsubdued. The violent peristalsis occasionally results in enteritis or peritonitis, and is sometimes followed by a kind of catarrhal dysentery. An attack of colic is only very rarely fatal.

Intestinal colic is distinguished from a similar affection of the *stomach* by the site of the pain in the latter case being higher in the abdomen—about the ensiform cartilage—by the deeper percussion note elicited over the area of the distended stomach, and by the absence of the visible or palpable distension and contraction of the coils of intestine. In *rheumatism of the abdominal wall* it is the contraction of the muscles, and not that of the intestines, which causes the pain, the latter being much increased by palpation with the tips of the fingers. Special signs distinguish *Renal*, *Hepatic*, and *Lead Colic*.

Ætiology.—Painful spasm of the bowel may be caused by (a) irritation due to the nature and condition of the intestinal *contents*, such as the fermentation or decomposition of long-retained feces, fecal accumulations, undigested or irritating or partly decomposed food, by taking ices or cold drinks, by the presence of excess of or morbidly acid bile, of gall-stones, bundles of round worms, coils of tape-worms, or irritant poisons; (b) by morbid states of the *wall* of the bowel—adhesions, contractions, volvulus, strangulation, intussusception, local inflammation, ulceration, or occlusion, as by the pressure of neighbouring organs; (c) *reflex irritation* from other abdominal viscera—*e.g.*, the kidneys, liver, uterus, ovaries, or bladder—from sudden and violent emotion, from exposure to cold, particularly of the feet, legs, and lower part of the abdomen; (d) by certain forms of general *blood-poisoning*, as rheumatism, gout, or malaria, or the presence in the system of lead, arsenic, or copper.

Young, nervous, and excitable individuals—especially females—and those who lead sedentary lives and are subject to constipation, the gouty and rheumatic, and dwellers in malarial districts, are predisposed to attacks of colic. In hysterical females the attack is often attended—sometimes followed—by a marked degree of flatulence; and in some instances it is of an epileptiform character, and may be preceded by a

kind of *aura* in the shape of numbness, formication, or choreic movements of a limb.

Treatment.—Such causes of mechanical obstruction as a hernia, twist, adhesion, or local contraction of the bowel must be sought for, and, if possible, relieved without delay. Pain may be promptly alleviated, and the spasm allayed, by a subcutaneous injection of morphine; the effect of chloroform inhalation is less lasting, but when opium in any form is contra-indicated, inhalations of amyl-nitrite, or frequent drop-doses by the mouth, of a 1 per cent. solution are valuable. At the same time the bowel should be emptied of its irritant contents, which may be effected by a large warm-water enema, while a combined sedative and purgative is given by the mouth—*e.g.*, a grain of opium with 5 to 10 grains of calomel, or 20 grains of rhubarb, followed by repeated doses of a saline aperient with some carminative, until all irritant ingesta and all hardened and knotty feces have been evacuated.

The hot bath is always useful, and mustard or turpentine stupes, followed by hot fomentations sprinkled with landanum, or large light linseed poultices, are grateful to the patient. Sometimes steady friction with warm oil or opiate liniments gives the greatest relief at first. The diet should be restricted to liquids, including small quantities of stimulants if necessary; copious draughts of hot water are often of service both in relieving pain and in favouring evacuation of the bowel, as well as in checking vomiting when this exists.

The colic-like enteralgia of nervous women usually yields to 20-grain doses of sodium salicylate. Colic occurring in malarial subjects is best treated with quinine and arsenic. Generally speaking, during the attack aperients should be combined with sedatives.

Treatment subsequent to the attack must be mainly prophylactic in character. The diet must be properly regulated, a fair amount of daily exercise insisted on, and a regular and sufficient daily evacuation of the bowels secured by a suitable combination of laxative and tonic drugs until their natural and spontaneous action has been re-established. The patient should be instructed to wear a knitted woollen abdominal belt and warm woollen drawers and stockings.

C. E. SHELLY.

COMA has been defined as "a state in which insensibility or a defect of con-

sciousness is associated with a tendency to death, chiefly by asphyxia."

All degrees of it may be met with, from a mere impairment of mental and bodily power, up to complete insensibility, from which the person cannot be roused, paralysis of the voluntary muscles of the body being absolute and complete. In this extreme form the patient lies motionless, except for the movements of the chest, lips, and cheeks during respiration; the breathing is stertorous, foam accumulates at the mouth, the sphincters are relaxed, the pulse may be full and regular, the faec livid, the lips dusky, and the extremities cyanosed. The pupils are dilated and sluggish, or insensible to light, and the parallelism of the optic axes is lost. The eyes no longer move in concert, a slight degree of divergence will almost certainly be found, and one eye may remain stationary whilst the other is in motion, or they may move in opposite directions.

The *prognosis* in a case of absolute coma is always grave.

The *treatment* would depend entirely upon the cause. Coma is met with in such widely differing states as cerebral hæmorrhage, abscess or tumour of the brain, meningitis, sunstroke, epilepsy, diabetes, and uræmia (*see* CONSCIOUSNESS, DISORDERS OF).

COMA-VIGIL is the name applied to a peculiar condition, in which partial unconsciousness is associated with insomnia.

It is occasionally met with in the later stages of typhoid and typhus fevers and delirium tremens. The patient lies with his eyes wide open, but is insensible to all that goes on around him, although his appearance suggests that he is awake. The pupils are generally of natural size, but sluggish; the pulse is frequent, and the breathing free from stertor.

The *prognosis* is very unfavourable, the condition almost invariably ending in death.

COMEDONES.—A comedo is a minute elevation formed by the retention of sebum, epithelial cells, and small hairs in the distended efferent duct of a sebaceous gland, the protruding portion of which usually becomes blackish from the accumulation of atmospheric impurities.

A small mite—the *acarus* or *demodex folliculorum hominis*—is frequently found in the contents of the sebaceous follicles, but its presence is devoid of pathological significance. The *acarus* may be

seen under a low power of the microscope, after mixing the sebaceous matter with oil, and measures from $\frac{1}{12}$ to $\frac{1}{6}$ of a line in length; it has a distinct head, thorax, and abdomen, and four legs attached to each side of the thorax; it lies with its head directed towards the deepest part of the follicle.

The *distribution, general etiology, and treatment* of comedones are practically those of acne vulgaris, of which they constitute the first stage, and to which reference may be made.

CONIUM, Poisoning by.—Independent of poisoning by pharmacopœial preparations of conium, fatal accidents have occasionally occurred owing to the resemblance between the leaves of hemlock and those of parsley.

The *symptoms* of poisoning by hemlock are extreme weakness and numbness, commencing in the legs and spreading upwards; dryness of the mouth and throat, giddiness, impaired vision, paralysis of accommodation, dilated pupils, slowing of the pulse, and death from cardiac and respiratory paralysis, or from convulsions and coma.

Post-mortem Appearances.—These present nothing characteristic; there are the usual signs of asphyxia, and, when the leaves have been taken, a green pulpy mass may be found in the stomach.

Treatment.—This would be the same as that recommended for narcotic poisons (see OPIUM, POISONING BY). Tannin and astringents are especially recommended to neutralize the alkaloid as far as possible. Atropine in hypodermic injections ($\frac{1}{4}$ of a grain) may be tried as a stimulant to the cardiac and respiratory centres. Strong tea and brandy, ether, or ammonia are also useful.

CONSCIOUSNESS, Disorders of
—1. **Perversion of consciousness** occurs in the various forms of insanity, in the delirium of fever, in diseases of the brain, in meningitis, and in cases of poisoning by narcotic drugs.

Delirium may be divided into three forms—(1) *Low muttering delirium*, when the patient lies in a quiet condition, mutters to himself in a rambling fashion, and picks at the bed-clothes. (2) *Delirium tremens*, a result of alcoholic excess. In this form the patient is very restless and sleepless, has illusions and hallucinations, feels all manner of horrid animals creeping about him, is very suspicious, and keeps up a perpetual rambling conversation with himself; his movements are

tremulous, and occasionally he has violent outbursts of raving delirium. (3) *Raving delirium*, in which the patient is very violent, raves furiously, and exhibits tremendous strength for a considerable period. In such cases there is often a fixed delusion. Delirium is most common during the period intervening between wakefulness and sleep.

2. **Partial loss of consciousness** occurs in some forms of hysteria, in somnambulism, trance, hypnotism, and catalepsy. In this condition there appears to be a complete loss of recollection of sensory perceptions, and there is subsequently no remembrance of what happened to the patient during the state. Consciousness can usually be restored at once by the application of external stimuli. Motor actions are readily performed in an automatic fashion without causing any perception.

3. **Complete loss of consciousness** may occur from a variety of causes, which may be thus classified:—(1) Poisons from without, such as alcohol, ether, chloroform, opium, and other narcotics; (2) poisons from within, as in the uræmia of Bright's disease, and in the coma of diabetes; (3) asphyxia from any cause preventing access of air to the lungs and due aëration of the blood; (4) syncope from failure of the heart's action; (5) concussion or compression of the brain; (6) epilepsy; (7) apoplexy, from hæmorrhage into the brain substance, or blocking of the cerebral vessels by a thrombus or an embolus.

It will be useful to point out the *symptoms* by which the cause of the loss of consciousness may be determined. In some cases the *diagnosis* can be readily made; in others it is exceedingly difficult, and in some almost impossible.

(1) When loss of consciousness is caused by *poisons* from without, the onset is gradual, and there is often a history of the poison having been taken. The pupils are usually dilated and react to light, and the conjunctival reflex can be obtained unless the coma be very profound; but in opium poisoning the pupils are contracted to pin-point size. The patient can usually be roused by external stimulation. The presence of the odour of alcohol cannot be relied upon, as it may have been given after the onset of the symptoms for the purpose of restoring the patient. Violent struggling and the absence of convulsions are in favour of alcoholism, as opposed to apoplexy.

(2) In *uræmia* the urine contains albumen, but this is also frequently the case

in apoplexy. A peculiar "hissing" breathing is present, unlike the stertorous breathing of apoplexy. The patient can be aroused to answer questions, but immediately relapses into the previous drowsy condition. The onset is gradual in chronic nephritis, but in acute nephritis it may be sudden. A history of anasarca may be obtained, and also of general convulsive fits. The presence of albuminuric retinitis points to uræmia, but does not exclude apoplexy. The temperature is usually depressed, and does not tend to rise as in apoplexy. The face is pale. The pupils are equal, and may be either dilated or contracted; they react slowly to light. The pulse is often hard and tense.

(3) In unconsciousness due to *asphyxia* the diagnosis can usually be readily made from the history of the case, the marked cyanosis, the physical signs of the non-entrance of air into the lungs, and from the fact that, if the obstruction be not speedily removed, death ensues.

(4) In *syncope* the onset is sudden, the pulse is very feeble or imperceptible, there is extreme pallor of the face, the respirations are irregular and sighing, reflex action is usually preserved, and the sphincters are rarely relaxed.

(5) In *convulsion and compression* there is a history of an injury, or an actual fracture of the skull may be found.

(6) In loss of consciousness after an *epileptic fit* there is a history of a fit having occurred; the face is cyanotic, the breathing stertorous at first, but the stertor soon passes off; the pulse is rapid, the pupils are widely dilated, and do not react to light; the limbs are relaxed and the plantar reflex is abolished. There is often blood about the mouth, from the tongue having been bitten. The urine and feces are evacuated involuntarily. The urine does not contain albumen except after a rapid succession of fits. Many of these symptoms are present in apoplexy, but after an epileptic fit the patient usually recovers in from five to ten minutes, which is not the case in apoplexy. Immediately after an epileptic fit there is often conjugate deviation of the eyes to one side, but this passes off in from three to five minutes.

(7) In *apoplexy* the onset is sudden, the breathing is stertorous, the pupils may be unequal or dilated, and do not react well to light. The superficial reflexes are abolished either on one or on both sides. There is no failure of the heart's action. The limbs are relaxed, or there is rigidity on one side. The face

is suffused, and there may be a persistent conjugate deviation of the eyes and turning of the head to one side. Albumen may be present in the urine. If the attack begin with a fit the convulsions are frequently one-sided. It must be remembered that hæmorrhage into the pons Varolii produces contraction of the pupils similar to that found in opium poisoning. The temperature is depressed, but this is soon followed by a rise above normal, unless death ensue rapidly.

In dealing with cases of unconsciousness supposed to be due to drink, it is a wise rule, especially in hospital practice, *never* to send a patient away until he is so far recovered as to be able to walk and to give his name and address.

Feigned loss of consciousness is a favourite symptom with malingerers, and should not be overlooked; the diagnosis is assisted by observing that the pupils are equal, and react readily to light; that winking is produced by touching the conjunctiva or by suddenly aiming a blow at the open eye.

The *treatment* of the various diseases which may give rise to loss of consciousness will be found under their respective headings.

C. E. BEEVOR.

CONSTIPATION (Costiveness).—

An undue retention of feces, owing to delayed, infrequent, or imperfect evacuation of the bowels.

Individual peculiarity may render a considerable variation from the general rule of a daily evacuation not incompatible with the maintenance of health; but in constipation, whether the bowels be relieved only at abnormally long intervals of time, or more frequently but to an imperfect degree, there results a tendency to the accumulation of feces, with secondary consequences of a more or less noxious character.

The motions consist of a few small, hard, dry fecal lumps, or of large masses compacted of an agglomeration of such scybala, and sometimes smeared with mucus or streaked with blood. They are passed with difficulty, often with pain; they may be very dark or light and clay-like in colour, and are apt to be very offensive in odour. These hard motions may alternate with, or even be accompanied by, diarrhœa, a symptom of the intestinal irritation caused by the retained scybala; or, again, the patient may complain only of diarrhœa—frequent, painful, loose motions, attended with griping abdominal pains (*tormina colic*)—until

by appropriate treatment the retained faecal accumulations have been dislodged.

The most common sites of faecal accumulation are the caecum, the colon, the sigmoid flexure, and the pouches of a relaxed and distensible rectum. These masses may produce over-distension of the bowel, with consequent paresis and extreme atrophy of its walls; or, by more localized irritation, may beget sacculations, inflammation, ulceration, and perforation of the gut. They may accumulate, with the result of its complete occlusion; they can readily induce colic, catarrhal dysentery, and sometimes jaundice; and by the pressure which they exert upon the abdominal nerves and blood-vessels—especially on those within the pelvis—may give rise to congestion of the uterus and ovaries, with catarrhal leucorrhœa, menorrhagia, or metrorrhagia. Hemorrhoids, spermatorrhœa, and prostatitis, pain in the course of the great sciatic nerve, numbness and pain in the thighs, and coldness of the feet and legs may result from constipation.

Amongst the more remote, but frequently observed, effects of chronic constipation are anæmia, with a dingy sallowness of the skin; amenorrhœa, anorexia, headache (usually frontal), vertigo, nausea, flatulence, thirst, and lithæmia; foul tongue, foetid breath, lassitude; hypochondriasis and irritability of temper are also occasionally symptoms of this condition. These symptoms, being mainly attributable to a sort of general blood-poisoning by re-absorption from unduly retained faeces (and closely analogous to certain forms of sewer-gas poisoning), are sometimes grouped under the term **copræmia**.

Recent researches tend to show that these symptoms are probably manifestations of the toxic effect of animal alkaloids (ptomaines (*q.v.*) or leucomaines).

Ætiology.—The immediate causes of constipation are—(1) *Mechanical* obstruction of the lumen of some part of the intestinal canal; (2) *scantiness* or excessive dryness and hardness of the contents of the large bowel; (3) *paresis* of its muscular coat.

More precisely the causes may be distinguished as—(1) *Local*, including blocking of some part of the intestinal tube by accumulated scybala, faecal concretions, masses of round-worms, or by foreign bodies introduced by the mouth or per rectum; the development of polypi or other new growths; cicatricial contraction rigidity from in-

flammation, ulceration, carcinoma, or syphilis of some part of bowel-wall; enfeebled muscular contraction and atrophy of the bowel-wall resulting from prolonged over-distension of the gut with faeces or gas, or from inflammation, adhesion on lead-poisoning; also in cases of general enfeeblement and senile atrophy; pressure exerted by extra-intestinal tumours, especially on the rectum, as by a displaced or gravid uterus, by uterine fibroids, ovarian tumours, or enlarged prostate; enfeeblement of the abdominal muscles, by repeated pregnancy, or by obesity; a painful state of the abdominal walls, as in rheumatism, and conditions in which attempted defæcation provokes pain, such as inflamed piles, fissure of the anus, chronic dysentery, and the like; the reflex inhibition sometimes induced by painful and inflammatory states of the pelvic viscera.

(2) *General*, including depressed vital activity, as from anæmia or excessive venery; excessive muscular exercise or mental application or sedentary habits; the abuse of enemata and purgatives, neglect of the habit of regular defæcation, prolonged sleep; the use of certain articles of food, such as salt meat, cheese, tea; the abuse of opiates, tobacco, spirits; the imperfect clothing and undue exposure of the feet, legs, and lower abdomen, especially in young children; a dietary yielding too small a proportion of nutritive residue, or too scanty in amount—the result in either case being faeces too small in bulk to excite full intestinal peristalsis.

Constipation is apt to be a prominent symptom in certain diseases of the stomach, liver, heart, and nervous system; in some febrile conditions, in diabetes, during prolonged lactation, and after excessive perspiration or exhausting discharges.

Treatment.—The causes of mechanical obstruction or pressure and painful conditions of the anus, rectum, and of the abdominal walls must be removed or palliated. Habits of sloth and indolence must be amended, and regular open-air exercise, especially walking and riding, should be taken early in the day, while excess in muscular exertion, as well as in mental application, are avoided. A daily solicitation of the bowels at the same hour should be persevered in, however meagre the result may be at first, and the desire to defæcate should not be thwarted or resisted; nor should the act be unduly hurried over; its efficient

performance is much aided if the opening in the closet-seat be so narrowed laterally as to afford ample support to the buttocks—not merely to the thighs in front, as is usually the case. Regular friction and kneading of the abdomen over the course of the large bowel, beginning at the cæcum, may be practised with advantage. Early rising, immediately followed by a cold bath or the cold douche to the abdomen; the application of a cold-water abdominal compress; ample woollen clothing of the lower limbs and abdomen, and support of a pendulous belly by an appropriate belt or bandage; faradization of the abdominal walls, or the galvanic current with one pole in the rectum, are all useful measures in certain cases.

The diet should consist largely of green vegetables and of ripe fruit, and the latter may often be taken at or before breakfast with advantage; coffee rather than tea or cocoa at this meal, and a moderate allowance of light bitter ale or porter at luncheon or dinner, answer well in some instances. Coarse oatmeal porridge, brown bread, hominy, and fats should—when they can be digested—be taken in preference to fine white bread and starchy food-stuffs; a considerable amount of fluids—especially water, toast-and-water, home-made lemonade, aerated waters—may be taken. A tumblerful of hot water, slowly swallowed at bedtime, and one of *fresh* cold spring-water sipped while dressing, often prove effective in the milder class of cases.

On commencing treatment it may be requisite to soften and break up fecal accumulations in the rectum by enemata of oil or warm water, and even to remove them piecemeal by the scoop (or the handle of a large spoon). Should a second day pass without any evacuation, a small enema of cold water or of a drachm or two of glycerine may be used at the usual hour of defecation. A pipe or cigar after breakfast or dinner is effective in some cases.

Drugs are quite secondary to general hygienic and dietetic treatment, but their employment is often necessary. The object of medicinal treatment is to relieve pain or spasm of the bowel, as, for example, by a full dose of opium or of nuphar; to improve the tone of the muscular coat of the intestine, to exalt peristalsis, and to increase the flow of intestinal mucus. To this end several drugs may often usefully be combined—*e.g.*, a pill containing extr. aloes aquos. gr. j, pulv. rad. ipecac. gr. $\frac{1}{2}$, extr. nuc.

vom. and extr. belladonnæ aa gr. $\frac{1}{4}$, taken every night or every alternate night, and gradually relinquished; extr. cascarr. sagrad. gr. j to grs. iiij may advantageously replace the aloes in some cases. Rhubarb, colocynth, and podophyllin, with hyoscyamus or belladonna, are also of value; and a small quantity (gr. $\frac{1}{15}$ or gr. $\frac{1}{12}$) of calomel may frequently be added with advantage. In anæmia and debility, iron—especially the sulphate—arsenic, and quinine are indicated; iron is well given, combined with rhubarb and aloes, in pill; and in the constipation of amenorrhœa a teaspoonful of the confectio sulphuris every morning greatly aids the effective action of a ferruginous aperient taken over-night. Aloes is a drug generally unsuitable in cases of hæmorrhoids, and in congested or inflammatory conditions of the pelvic viscera, when the laxative electuaries are preferable. A dose of some effervescent saline laxative or of an aperient mineral water taken on rising is a useful adjuvant to other measures, but should not be relied on exclusively, or habitually taken for too long a period. A teaspoonful of the compound liquorice powder of the Prussian Pharmacopœia is generally useful. A few drops of syrup or of honey or of olive oil often act well in very young children; and a teaspoonful of olive oil, cod-liver oil, or castor oil every morning before breakfast suits some persons. When the secretion of bile is deficient, and after much bilious vomiting, pills containing 2 or 3 grains of dried ox-gall are valuable; nux vomica, belladonna, and small doses of carbolic acid are useful where flatulence is a troublesome symptom.

In treating constipation it is most important to avoid any approach to excessive or exhausting purgation; the bowels are first to be thoroughly relieved of distending fecal accumulations, and must then be strengthened and educated to do their own work unaided. As regards drugs, laxatives must be combined with intestinal tonics, and, as the normal function of the bowel is by degrees re-established, the aperient agent should be gradually withdrawn from the prescription, while the tonic ingredient may often be usefully continued for a considerable time.

C. E. SHELLY.

COPPER, Poisoning by.—All the salts of copper are, when taken in sufficient quantity, irritant poisons.

The prominent *symptoms* are a coppery

taste in the mouth, a sense of constriction in the throat, thirst, and pain and tenderness in the abdomen. Vomiting and retching soon set in, the vomited matters being blue or green; purging and tenesmus are also present, the stools sometimes containing blood. Jaundice, suppression of urine, and cramps in the extremities are amongst the later phenomena; the breathing is hurried and difficult, and the extremities cold. Death may ensue from coma or convulsions.

Post-mortem Appearances.—Inflammation of the mucous membrane of the alimentary canal is the chief change present; ulceration is rare; the liver may be fatty and friable; the cortex of the kidneys swollen and pale.

Treatment.—To get rid of the poison by the use of the stomach-pump and emetics is the first and chief indication; albuminous substances, such as white of egg, should be administered to render the poison inert. For the rest the treatment would be symptomatic, opiates or stimulants being used if necessary.

Chronic poisoning may result from the use of copper vessels in cooking, or from exposure to the effects of copper in certain trades. The chief *symptoms* are a general and increasing loss of power, colic, constipation, or diarrhoea and jaundice; retraction of the gums and a purple line along them have been described.

CORN (Clavus) and CALLOSITY.

—Intermittent pressure on, or friction of, yielding portions of skin causes hypertrophy of the horny layer of the cuticle, the rete Malpighii and subjacent papillæ being also somewhat inflamed and infiltrated.

Callosities thus produced constitute familiar "trade-marks" of various occupations (coachmen, oarsmen, smiths). A *corn* differs from the preceding form mainly in the involution and downward growth of the hypertrophied horny layer to form the so-called "root" in the centre, which, pressing upon the subjacent papillæ, either cause their inflammation or atrophy. The pain due to the pressure of this peg of tightly packed, hard epidermic cells upon the sensory nerves is either dull or exquisite, and often radiates widely, causing a feeling of extreme fatigue in the limb. It has lately been shown that the underlying sensory nerves undergo enlargement. Some corns, apparently from their hygroscopic properties, give rise to most pain in damp weather, the advent of which some-

times prophesy with unfailing certainty; while others cause most annoyance in dry and frosty weather. Corns are almost invariably produced by tight or badly fitting boots, the two conditions being often combined, and their commonest seats are the ball of the big toe, the outer side of the little toe, and the dorsal surface of the intervening toes. When situated between the toes, corns are "soft," owing to persistent maceration.

Treatment.—Callosities may be reduced, when expedient, by the prolonged application of a 10 per cent. solution of salicylic acid in ether, or of a simple ointment of salicylic acid of the same strength. Corns are best treated by prolonged soaking in hot water, subsequent shaving, and the excision of the "root." Many cases, however, yield to the persistent application of Unna's salicylic acid plaster-mulls, or to daily painting with a saturated solution of salicylic acid in flexible collodion. The innuonction every morning of a little soft soap is generally sufficient to prevent their recurrence, always provided that proper boots be worn. J. J. PRINGLE.

COUGH.—A cough is a violent and sudden expiration whereby the closed glottis is forced open, and any accumulated mucus in the larynx or trachea is expelled. A cough is generally a symptom of some affection of the lungs or respiratory tract, but it is also very often due to some morbid condition of the throat—e.g., enlarged tonsils, elongated uvula, or granular pharyngitis—and in a considerable number of cases it is of purely reflex origin, and depends on gastric irritation, disease of the ear, or other distant lesion. The *treatment* of cough is given under its various causes.

COUNTER-IRRITATION is a method of overcoming pain, inflammation, or other change in a part or organ by an effect produced on the skin in the immediate neighbourhood or at a distance.

There are three stages or forms of counter-irritation. In the mildest form, rubefaction is produced; in the next, vesication; and in the most severe, pustulation, or local destruction of tissue. Mustard is the best rubefacient. As a vesicant, nothing answers so well as the liquor epispasticus. A liniment of croton oil or antimony may be used to produce pustulation. By the use of the actual cautery, setons, and issues, still more severe and protracted changes are produced.

CRAMP.—A painful tonic spasm, especially liable to attack the muscles of the calf, occurring more often during the night than the day. It seldom lasts very long, but the pain is agonizing. Putting the extensor muscles into action, or grasping the thigh firmly, is the best means of relieving it. Some cause of irritation affecting the stomach or intestines will occasionally be found. It is met with in the subjects of chronic nephritis, and is also often an indication of a neurotic tendency. Not infrequently it is the forerunner of epilepsy.

CRANIOTABES.—An atrophy of the cranial bones occurring in infancy. The term is not, however, applied to a uniform thinning of any cranial bone. Shallow conical pits are seen at the necropsy, the wide part of the cone being on the inner surface. The pit is not smooth on the inside, but granular, and on the outer surface and around the margin may be seen a worm-eaten appearance, due to the presence of more or less osteophytic overgrowth. Possibly the bone is primarily the seat of a rarefying osteitis, and the softened bone atrophies from within from the combined effect of the weight of the brain and the counter-pressure or resistance of the pillow on which the child rolls its head. The seat of election of craniotabetic pits is the posterior inferior region of the parietal bone, but the superior part of the occipital bone, the temporal bones, the upper surface of the orbital plates of the frontal, and very rarely the upper parts of the frontals and parietals, may be affected. During life careful palpation and pressure may be needed to discover the wasted spots, as the pitting starts from within, and until it has nearly reached the external lamina pressure cannot indent the bone, and the so-called "parchment-crackling" is not obtained. The number of atrophic areas varies much in different cases. Mere marasmus is held not to cause this affection, but the writer cannot assent to this view; it is probable that rickets and syphilis are causative, but the relative influence of each factor must always be difficult to estimate. Frontal bossing is often more evident in those cases in which rachitic changes are present in the other parts of the skeleton, and when there are rachitic nervous symptoms. Craniotabetic spots are often associated with the soft vascular stage of Parrot's bosses—an argument in favour of the pathology (of the pits) above given. Some

observers, however, hold that there is a mere chemico-physical change in the bone, not a recognizable rarefying osteitis. Craniotabetic pits may be due to a premature formation of the markings of the convolutions on the inner face of the calvaria; they certainly almost invariably occupy the early formed convolution-impressions. The atrophic areas are seldom present at birth, but are common during the first months of life; they are less often seen after the tenth month, and are still more rare after sixteen months. That they are in some way associated with the rapid growth and development of the brain appears certain. Craniotables is a purely physical condition, entailing, as a rule, no risk to life, and causing no symptoms. Signs of rickets may be detected, and also those of syphilis; sometimes one, sometimes the other disease preponderates.

ANGEL MONEY.

CRETINISM, ENDEMIC.—Endemic cretinism is met with in various parts of the world, but is most common in the valleys of Switzerland, Savoy, Piedmont, and the Tyrol; it does not occur in Great Britain. The prominent features are a varying degree of idiocy, with arrested development, the subjects of the disease seldom reaching 5 feet in height. In a considerable proportion of the cases there is an enlargement of the thyroid gland. In places where cretinism is endemic, goitre is also endemic, and to a much greater degree; and it has been observed that when a family migrates to such a neighbourhood, some members of it will speedily become goitrous, but no cretins will appear amongst them for two or three generations. Children may become cretinoid if taken to live in one of these districts during the early period of development. The only constant factors known about these districts are that the soil is damp, and that it contains a large amount of magnesian limestone. Certain changes at the base of the skull, especially the premature ossification of the bones entering into its formation, have been regarded by Virchow as the cause of cretinism, but it would seem more probable that both these and the goitre own some further cause, and that, in some way not yet understood, the nature of the soil plays an important part in the causation of the disease. Removal to a more healthy district is the only measure available; it will at any rate prevent the children subsequently born from being cretins.

CRETINISM, SPORADIC — a congenital deficiency of intellect occurring with stunted development and other peculiarities.

Sporadic cretins may be easily recognized by their low stature—they are seldom more than 3 feet high, often less; by their large, flat-topped heads, pale, earthy complexions, and spade-like hands and feet. The hair is coarse, dry, and scanty, the skin rough and scurfy; the hands, feet, and eyelids are often puffy, and the extremities cold. The bridge of the nose is generally depressed, the mouth large, with thick lips and a large semi-protruding tongue. As a rule, the isthmus of the thyroid appears to be wanting, and the rings of the trachea can easily be felt. Very often soft pads, consisting of fat, can be perceived in the supra-clavicular spaces on either side. Development proceeds slowly: the anterior fontanelle may not be closed until the fifth year, or even later; dentition is delayed, and the teeth are apt to decay early; the long bones are stumpy and enlarged at their ends, and the hands and feet peculiarly square, with short fingers and toes; puberty is delayed. Cretins change very little as they grow older, and it is almost impossible to form even a guess at their age. The intelligence is very imperfect; it is seldom that they can even speak. As a rule they are good-tempered. Certain changes at the base of the skull have been found, but not the premature synostosis regarded by Virchow as the cause of endemic cretinism. The thyroid has been found to be absent on post-mortem examination. The analogy between this condition and myxœdema is most striking; the two diseases would appear to differ only in that the one is congenital and the other a disease of adult life. Sporadic cretinism has no relation with goitre, and is not hereditary. Cases have occurred where the mother has borne many children previously, and where she has borne few. Intoxication of the parents at the time of coitus has been suggested as a possible cause. It is equally common in the two sexes. The *treatment* would be the same as for other forms of idiocy in children.

CRISIS.—Febrile affections which end abruptly are said to terminate by crisis. The best example is acute pneumonia, in which disease the temperature, in uncomplicated cases, usually falls suddenly on or about the seventh day. Diseases which commence suddenly have

a tendency to end in a similar manner, whilst those in which the onset is gradual rarely terminate by crisis; the temperature chart in typhoid fever, for instance, hardly ever shows a well-marked "crisis." The belief that a critical evacuation may carry off a fever is no longer entertained.

CUPPING is a mode of drawing blood to the skin with a view to relieve internal inflammation or congestion. A cupping glass is a small bell-shaped glass capable of holding 3 or 4 ounces; the air in this having been rarefied by heat (preferably by setting alight a drop of methylated spirit placed in it), the glass is applied to the skin, taking care to avoid a bony prominence. As the glass cools, the skin will be forcibly drawn into it, and will at the same time become congested. The cup should be left on for a time varying from ten minutes to half an hour, according to the object desired, and then removed; this constitutes *dry cupping*. In *wet cupping*, previous to the application of the cup, the skin is cut in about a dozen places by means of a specially devised instrument with that number of little blades, arranged in two parallel rows close together, and constructed so as to cut to any depth that may be considered best. The cupping glass, when warmed as before and applied over this area, rapidly becomes filled with blood, and in this way several ounces of blood can be speedily abstracted. The number of cups to be applied in either form of cupping will depend upon the nature of the case.

Dry cupping is chiefly employed in inflammatory affections of the bronchi, lungs, or kidneys. The applications of wet cupping will be found under **VENE-SECTION**.

CYANOSIS is the blue livid tint which the skin presents in certain diseases. It is due to the presence in the capillary vessels of insufficiently oxygenated blood, but never to the admixture of arterial and venous blood. It is met with in cases of congenital malformation of the heart, in long-standing heart or lung disease, in suffocation, and locally when an important vein is obstructed or compressed.

CYSTOCELE is descent of the bladder, pushing before it the anterior vaginal wall through the vulval orifice. It is usually the first stage of uterine procidentia; for the ordinary course

of that affection is that the descending anterior vaginal wall drags after it the uterus, and the uterus the posterior vaginal wall. The anterior vaginal wall descends first, because it is the least supported part of the pelvic floor.

The *causes* of cystocele are allied to those of displacements in general—viz., deficiency of muscular tone, which is generally a result of lowered nervous energy, and overstrain of muscular and fibrous structures, leading to their stretching or rupture. Such a condition of the muscular and fibrous structures of the pelvis is a frequent result of parturition, and the nervous and muscular tone is often lowered by the mental, emotional, and physical strain of lactation and the care of young children. Hence cystocele is in the majority of cases a sequela of child-bearing. Cystocele, however, occasionally occurs in women who have not borne children. It is most often met with amongst those whose employment involves physical strain, and comparatively seldom in the well-to-do.

The *symptoms* are a feeling of weight, "bearing-down," and aching in the back, lower abdomen and thighs. The call to micturate occurs with undue frequency. The patient can feel a protrusion between the labia and, if it be large, she may find that she cannot empty the bladder until she has pressed this up. All the symptoms disappear when the patient is recumbent, and are aggravated by violent or prolonged exertion.

Diagnosis.—A swelling covered by mucous membrane can be seen presenting at the vulva and separating the labia. On vaginal examination this is found to be the anterior vaginal wall. A much curved sound passed into the urethra with its concavity backwards is felt to pass into this swelling.

Treatment.—If the symptoms be very slight, they may be relieved by medicines which restore depressed nervous tone, such as quinine and strychnine. If these

fail, local treatment will be needed. If the vaginal orifice be not much dilated, a vaginal pessary will afford relief. The best for this purpose is Hewitt's "cradle" pessary. The patient can be taught to take it out and replace it herself. A ring of watch-spring covered with india-rubber, or one of the varieties of Hodge's pessary, is also useful. These instruments the patient can remove, but cannot replace, because she cannot, except by accident, get its posterior arch behind the cervix. If one of these pessaries be used, it should be removed, the parts examined, and the pessary cleaned and replaced at least once in three months. While wearing it the patient should syringe the vagina with warm water night and morning; otherwise, especially if an india-rubber instrument be used, an offensive discharge may result. If the vaginal orifice be much dilated, no vaginal pessary will be retained. The choice then lies between a pessary supported by bands attached to a waist-belt—one of the many forms of cup and stem pessary—and an operation to contract the vagina. Such an operation should only be done in patients who have ceased bearing children. In some cases it will, without further treatment, remove the symptoms, but this only happens in the minority of cases. In most, however perfect the result seem to be a few weeks after the operation, the downward pressure of the anterior vaginal wall again dilates the artificially narrowed vaginal orifice, and the old state of things is reproduced. But the narrowing of the vaginal orifice will enable the patient to wear a vaginal pessary, and so do without the waist-belt and straps. A properly adjusted vaginal pessary does not itself press into the vaginal orifice, and will prevent the anterior vaginal wall from doing so. More than this cannot be promised with certainty as the result of operation.

G. E. HERMAN.

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DEATH, MODES OF.—Failure of the heart or of the respiratory mechanism is always the ultimate cause of death, although in many cases the brain, pons, or medulla is the part primarily affected, the respiratory or cardiac centre being subsequently paralysed, death then occurring from *coma*. When

the failure of vital power is very gradual it may not be possible to determine whether death commenced at the heart or lungs; for example, in cancer affecting the alimentary canal, in cases of persistent diarrhoea or vomiting, and in other wasting disorders. Death occurring in this manner is said to be due to

asthenia. But in the majority of instances it can be readily determined whether death commenced at the heart or lungs, the former being the more common. *Syncope* is the term used to denote death from cardiac failure. It may be absolutely sudden, occurring either in ventricular systole or diastole, and due either to spasm or paralysis of the heart; in the one case the cavities are found empty; in the other, full of blood. Diseases of the heart, such as fatty or fibroid degeneration, or of the coronary arteries, valves, or aorta, are the chief causes of sudden death under this head. In this group may also be included sudden death from violent mental emotion, from drinking cold water when heated, from a sudden blow in the epigastrium, or severe injury to any part of the body—*i.e.*, from *shock*, however caused. In other cases the heart failure is more gradual, and is shown by faintness, giddiness, nausea, pallor, coldness, sweating, and dimness of sight; the pulse becomes rapid, feeble, and is finally extinguished, insensibility supervenes, and the heart's action ceases; the cavities of the heart will be found relaxed and more or less full of blood. Another form is death from loss of blood, as betrayed by extreme pallor, fainting, and delirium. After death the heart will be found contracted. In death from *collapse*, the heart sounds become feeble, the features sunken, but there are no subjective symptoms and no loss of consciousness; eventually, death is sudden. Death commencing at the lungs is from *asphyxia*. It may be sudden, owing to paralysis of the respiratory centre in the medulla, as in the case of certain brain diseases, especially those involving the base of the brain; or from the effect of certain poisons on the medulla, or from plugging of a branch of the pulmonary artery. The respiratory centre may be gradually paralysed in various ways by occlusion of the trachea or larynx, or from deficiency of oxygen in the respired air. In all cases of *asphyxia* the lungs and right side of the heart will be found engorged and the left side empty.

JOHN ABERCROMBIE.

DELUSION.—Delusions are false beliefs which affect the actions and manner of life, which appear incredible to persons in the same condition of life as the person who expresses them, which are not recognized on an appeal to reason, and which are the result of an abnormal condition of the brain. They must be distinguished from hallucina-

tions, which are sensations in the absence of external stimuli, and illusions, which are false perceptions of actual objects. Delusions may be systematized or unsystematized. The former are of serious prognostic import, and are best seen in cases of chronic insanity. Three chief varieties may be mentioned—(1) of imaginary greatness, (2) of secret agencies and persecution, (3) of suspicion. Systematized delusions are compatible *inter se*, generally incompatible with the laws of nature, and nearly always originate in sense-perversions. Unsystematized delusions, such as the fleeting delusions of general paralysis or mania *a potu*, occur in most cases of insanity, are of every conceivable variety, have little relation *inter se*, are generally perversions of possible or even actual facts, frequently do not depend upon disorders of the senses, and are the external expression of abnormal brain action or mere mental confusion.

G. T. REVINGTON.

DEMENTIA.—This term is used to designate acquired mental weakness, as distinguished from Amentia or congenital weak-mindedness.

Symptoms.—The prominent characteristics of dementia are loss of reasoning power and of the faculties of attention and origination, weakening of the powers of observation, imagination, memory, and volition, scantiness of the association of ideas, feebleness of the emotions, limited reaction to environment, partial loss of self-control, self-respect, and of regard for the decencies of life, and finally loss of the dominant human feelings—affection, hope, and ambition.

The only difficulty of *diagnosis* is the distinction between the temporary form of dementia, or secondary stupor as it is well called, which follows acute attacks, and is curable, and the incurable secondary dementia.

No *prognostic* characteristics can be as yet pointed out; each case must be judged separately, and apparently hopeless cases will occasionally recover, while cases with every favourable symptom end in dementia.

Varieties and Aetiology.—Dementia has been well described as “the goal of all the insanities,” and to get a complete grasp of this subject the reader must refer to the articles on the various diseases mentioned below.

The following varieties are usually described:—(1) Primary, (2) secondary, (3) senile, (4) organic, (5) alcoholic.

(1) *Primary dementia* is a misnomer,

and cases which fall under this head in current literature will here be treated with melancholia and the insanity of stupor.

(2) *Secondary, Sequential, or Terminal Dementia*.—This is the most typical form, and nearly always occurs after an acute attack, more frequently after mania than melancholia, and is the result of disease attacking a brain which is just attaining its highest development, and occurs, therefore, chiefly in the insanity of adolescence, from eighteen to twenty-five years of age. The dementia which results from acute attacks after the age of twenty-five is usually complicated with delusional or maniacal symptoms. The duration of the attack and the intensity of the symptoms have only a slight, if any, influence in determining the occurrence of dementia after the acute attack. Heredity is the great factor, and, the further knowledge advances, the more firmly is the opinion held that original brain constitution determines the progress of disease towards either recovery or dementia, whether that brain constitution be due to obvious heredity, to reversion, or be apparently adventitious. The characteristic features of secondary dementia, in addition to the general symptoms of dementia previously described, are the absence of motor symptoms, such as we find in congenital weak-mindedness or in general paralysis, the excellence of the bodily health as a rule, the capabilities of useful employment and the stationary character of the mental symptoms, which often remain unchanged for twenty or thirty years.

(3) *Senile Dementia*.—The insanities of the senile period will be treated separately. Their most striking characteristics are the marked tendency to end in weak-mindedness, the complication of the dementia by maniacal or melancholic symptoms, the marked eroticism, and the filthy habits.

(4) *Organic dementia* differs chiefly from the senile form in the causation, and includes all forms of weak-mindedness resulting from gross brain lesions, such as apoplexies, softenings, and tumours. Post-apoplectic dementia is the commonest form, and is generally a mild type of weak-mindedness.

(5) *Alcoholic Dementia*.—This form presents no special features distinguishing it from other forms of dementia, and is treated under the head of INSANITY, ALCOHOLIC.

Pathology.—The morbid anatomy of dementia cannot be separated from the

morbid anatomy of all chronic insanity. The general brain atrophy, the compensatory thickening of the brain membranes, and the excess of fluid in the meshes of the pia mater, the cellular degeneration, and the increase of neuroglia are common to all, and are probably more the result of long-continued disuse than the cause of the dementia. It is possible that dementia is the result of a lowering of function—that is to say, of changes as yet unrecognizable by our histological methods.

Treatment.—While secondary dementia will remain the typical form, all insanity tends to end in dementia. Every insanity is, in fact, a potential dementia, and, as has been well said, “the cardinal problem of psychiatry is to avert this tendency;” and when we consider that 40 per cent. of all fresh cases of insanity actually end in dementia, and that two-thirds of the total number of the insane are demented, we see what an important problem this is. The term dementia should be limited to the established and incurable forms, and treatment directed to the temporary dementia, better termed the secondary stupor, which supervenes on the cessation of the acute symptoms. The cardinal principles of this treatment should be attention to the bodily health, abundance of food, and employment in the open air, with, in some cases, the use of tonics, the cold shower-bath in summer, the Russian douche, electricity to the head, and possibly massage, and most emphatically the avoidance of narcotics.

G. T. REVINGTON.

DEMULCENTS are substances which are administered for their soothing effect on mucous membranes. Their action is probably mechanical. They are white of egg, starch, glycerine, gelatine, gum, honey, linseed tea, linseed, almond and olive oils.

DENTITION.—Any symptoms of illness occurring in an infant at or a little over six months of age should suggest the possibility of teething being the cause, and this applies also to somewhat older infants who have already cut some teeth, but not all. The troubles to which dentition may give rise are most varied. A febrile condition, fretfulness, disturbed sleep, convulsions, cough, or diarrhoea are the most common. A child is apt to present the same symptoms with each tooth. If the gum be swollen, hot, and tender, and of a dark colour, it is highly probable that a tooth is causing irrita-

tion, and lancing the gum in such a condition will often give relief, but, unless the tooth be nearly through, it is worse than useless to lance the gum, and some authorities are of opinion that the same may be said of the operation under any circumstances.

DEPLETION is the means whereby engorged blood-vessels are relieved of some of their contents. It is of two kinds, either general or local; of the former, venesection and purging are the most efficacious, the production of vomiting or sweating being less useful measures; whilst blood-letting by means of leeches, cupping, or scarification constitutes the local measures of depletion.

DERMATITIS is a convenient generic term used to designate an ill-defined and extensive group of symptomatic inflammations of the skin characterized clinically by redness, heat, swelling and pain, terminating in resolution, suppuration, gangrene, or chronic dermatitis. The distinction between dermatitis, erythema and eczema is a purely arbitrary one, based rather on causal than on clinical or anatomical differences. Thus, in all, the essential process is an erythema the further progress and development of which depend upon the duration, intensity and quality of the exciting cause and the physiological vitality or idiosyncrasy of the individual. The various grades of severity comprise the formation of erythematous patches, papules, vesicles, pustules, bullæ, and the occurrence of hæmorrhage and gangrene. J. J. PRINGLE.

DERMATITIS GANGRÆNOSA (*Sphaceloderma*) may be primary or secondary to other skin diseases. The primary form occurs most frequently in adults as the expression of special constitutional depravity, and is symmetrical in its distribution. The lesions are at first reddish or purplish erythematous spots, usually on the trunk and extremities, which vesicate, rapidly become gangrenous, and slough; they are attended by fever and constitutional disturbance. Spontaneous recovery generally ensues after a more or less prolonged period, each spot leaving a scar, but relapse is frequent. The condition presents many points of affinity with Raynaud's disease, diabetic gangrene, acute bed-sore, and to a form of gangrenous rash which sometimes accompanies acute cerebro-spinal meningitis.

It is closely simulated by the feigned

or artificial skin diseases produced by hysterical subjects or malingers. These are situated on the front of the chest, or more easily accessible portion of the limbs, generally on the left side, and are produced by scratching with the nails, the pressure of coins, or the application of caustic substances. They rapidly recover when the patient is carefully watched and the ulcers are protected by simple dressings.

The secondary form is most common in strumous and syphilitic children, and may succeed any antecedent pustular skin disease—*e.g.*, eczema, impetigo, vaccinia, and especially varicella (*V. gangrænosa*). The gangrenous patches may be numerous and extensive, accompanied by very high temperature, and death may rapidly ensue, or a series of minute pustules, each of which sloughs and leaves a scar, may appear in crops, and prolong the disease for an indefinite period. There is considerable presumptive evidence that the condition depends upon the presence of a specific micro-organism.

Occasionally the lesions are very trifling, but itching may be a troublesome symptom (*e.g.*, in varicella prurigo of Hutchinson).

In adults a similar ulcerative gangrenous action may affect spots of psoriasis and lichen ruber.

Treatment.—(1) *Constitutional.*—All tonic remedies are indicated, especially quinine and sulpho-carbolates, cod-liver oil being of special value in children. In many cases affecting adults opium proves invaluable.

(2) *Local.*—Any soothing ointments may be applied, the oleates of bismuth and zinc being perhaps the most generally useful. Dilute ammoniated mercury ointment is sometimes efficacious in children. J. J. PRINGLE.

DERMATITIS PAPILLOMATOSA CAPILLITII (*Acne Keloid, Sycosis Frambæesiformis*) is a rare form of chronic disease which affects the nape of the neck and adjacent portion of the scalp. The initial lesions consist of minute red papules, which occasionally suppurate, and are usually traversed by a hair. When pierced, a surprising amount of thin, mucoid discharge may emerge from these, as in cases of kerion. Ultimately the papules coalesce to form extensive, irregular, hard, white or reddish, keloid-looking growths, from which a few brush-like bundles of atrophied, but firmly adherent,

hairs protrude. Subsequently papillomatous tumours develop, which suppurate and break down, leaving extensive scars. Most described cases have occurred in males of middle age, and have caused little pain.

The growths consist of hypertrophied papillæ, with dilated blood-vessels, and infiltrated with leucocytes; subsequently fibrous tissue is formed. The development of papillomatous excrescences is by some authorities considered as accidental, while others consider the relationship with carcinoma as an intimate one.

Treatment consists in the destruction of the disease by caustics, or its removal by excision. J. J. PRINGLE.

DERMATITIS VENENATA is the result of the contact of irritating substances with the skin. The condition is common, as a chronic one, in many trades which necessitate the handling of noxious matters, or even the immersion of the hands and arms—the parts most frequently affected—in water. Grocers, bakers, bricklayers, colourmen, flax-spinners, French polishers, potmen and laundresses may be particularly instanced. A form of dermatitis (tar acne, *acne picealis*), which involves chiefly the extensor surfaces of the limbs; is common in fibre-dressers, who work with paraffine, and in persons otherwise brought in contact with preparations or vapours of tar or its congeners (creasote benzine, oil of cade, impure vaseline), in which the inflammation and blocking of the sebaceous follicles by dark comedones are prominent features. Aniline dyes employed to impart gaudy colouring to cheap flannel underclothing, acids, bichromate of potash, alkalis and arsenical preparations are all frequent causes of dermatitis. Many substances employed medicinally act in a similar manner—*e.g.*, those used as counter-irritants (croton oil, cantlarides, savin, tartar emetic, mezereon, turpentine, mustard); or as caustics (nitrate of silver, chloride of zinc); and occasionally carbolic acid, arnica, chrysarobin and mercurial ointments. A very severe form of acute general dermatitis is common in America, due to contact with, or even proximity to, different varieties of the botanical genus *Rhus* (poisonous sumach, poison ivy), the immediate causative agent being an exceedingly volatile acid which they contain.

Treatment must in every case be

directed to the cause. Soothing local applications alone are seldom efficacious. Protection of the exposed parts—*e.g.*, by india-rubber gloves—is always advantageous, but to secure permanent recovery it is often necessary for the patient to change his occupation.

J. J. PRINGLE.

DESQUAMATION is the process of shedding the skin seen during recovery from certain ailments. After scarlet fever the skin peels off in layers, and such a peeling in any person is always strongly suggestive of a recent attack of that malady. After measles there is often a branny desquamation.

DIABETES INSIPIDUS.—Under this term are included certain cases the leading symptoms of which are great thirst and the excessive secretion of urine free from sugar and of low specific gravity.

Symptoms.—The disease often commences suddenly after the occurrence of some injury or nervous shock. It may, however, be gradual in its onset, and it has been known to be congenital. The first symptom complained of is an excessive secretion of urine, though thirst very quickly ensues.

The urine is passed in large and sometimes in almost incredible quantities; 30, 40, and 50 pints a day are recorded. It is pale, almost colourless, and clear; its specific gravity ranges from that of water to a few points above this. The percentage of solid matters in the urine is greatly lowered, but the daily total excretion is in most cases increased. The urea is usually increased in amount; in some cases the phosphates and in other cases the chlorides have been excreted in excessive proportion, but ordinarily the normal ratio of the different solid matters remains undisturbed. Inosite has been discovered in the urine in several cases, but very rarely is albumen or any other foreign substance found.

Thirst is intense, and sometimes unquenchable, and it is to be noted that limitation of the fluids imbibed does not suffice to lower the excretion of urine to the normal. The tongue and mouth are in nearly all cases dry, but in a few instances an excessive secretion of saliva has been observed. The appetite is, as a rule, not increased, as is the case in diabetes mellitus; yet, again, it may in rare instances be voracious. The skin is dry and harsh, but boils, carbuncles, and pruritus are not observed.

In severe cases the general health is always affected. The patient emaciates greatly, becomes weak and languid, and complains of epigastric and other pains; the nervous system is disturbed, insomnia, irritability of temper and mental feebleness being symptoms of common occurrence. In other instances, again, the general health remains good, and the patient is only troubled by the thirst and frequency of micturition.

The *course* of the disease is very variable. Complete recovery may take place, but it does so in a small proportion of cases only. More commonly, a stationary condition is reached, and the patient may then, in the absence of complications, live for years, and even attain old age. On the other hand, the disease may gradually cause exhaustion, with failure of the heart and general œdema, and from this, or from the super-venition of phthisis or pneumonia, the patient at last dies.

The *duration* of the disease is as variable as its course. Some cases, especially those due to traumatism, are very rapid in their progress, whether towards death or recovery; others may last for many years. The occurrence of an acute febrile disorder not infrequently suspends, or for a time diminishes the intensity of, the affection.

Diagnosis.—The main symptoms are usually so pronounced as to render the diagnosis easy. It is necessary, however, to distinguish the disease from symptomatic and temporary polyuria, such as may follow excessive potations or the exhibition of diuretic drugs, and may also occur in hysteria and in convalescence from acute fevers. In this condition the thirst and emaciation of diabetes insipidus are absent.

Prognosis.—The small proportion of cases which end in recovery renders the prognosis in most instances unfavourable. The immediate gravity of the prognosis depends upon the extent to which the general health is affected, and the presence or absence of complications. The nutrition is least disturbed in those cases which arise after cerebral injuries, mental emotion, and acute febrile attacks, and in those which are congenital or occur in the very young without apparent cause. When phthisis or pneumonia has set in, and when the disorder is secondary to cerebral tumour or meningitis, the prognosis is necessarily most grave.

Pathology and Morbid Anatomy.—The disease shows a special association with lesions of the nervous system. In eleven

out of forty-two cases collected by Sir W. Roberts cerebral tumour or inflammation was found, not uniform in its localization; and Dr. Dickinson has recorded a case of diabetes insipidus associated with malignant disease of the solar plexus.

Unless the disease be a result of a gross lesion of the nervous system, as in the instances just mentioned, the morbid anatomy of the disorder reveals only lesions which are secondary to the excessive flow of urine and the marasmus. Thus, the kidneys have been found dilated and sacculated; in other cases they were enlarged and congested; and, again, they have contained multiple abscesses. Pneumonic or tubercular lesions of the lungs are frequently found, and may be the determining cause of death.

The proximate cause of the constant diuresis is a persistent dilatation of the blood-vessels of the kidneys. This, however, is itself a secondary condition, and is undoubtedly brought about through the vaso-motor system of nerves. The disease, therefore, can be caused by a lesion of the vaso-motor nerves in any part of their course, in the sympathetic system, in the spinal cord, in their centre in the fourth ventricle, or in the higher cerebral mechanism which communicates with the vaso-motor centre. The relation of gross nervous lesions to the disease is thus easily explained. Where such lesions are absent, we must assume that a functional disorder of the vaso-motor system exists, giving rise to the constant renal congestion. Bernard found that puncture of a certain spot in the floor of the fourth ventricle caused a copious secretion of urine which contained neither sugar nor albumen. In a few instances disease has localized this simple polyuric centre with a certain degree of exactness. Luys and Kien both found fatty degeneration of the nervous tissues in the floor of the fourth ventricle, and tumours in this situation have occasionally caused the disease. In three cases, recorded by Flatten, Gayet, and Kämutz, together with the polyuria, paralysis of the sixth nerves was observed, thus apparently localizing the lesion to the neighbourhood of the centre for these nerves. The writer also has recently observed a case in which, after an attack of meningitis, diabetes insipidus occurred, together with partial paralysis of both sixth nerves.

Ætiology.—Males are more often attacked than females. The disease may be congenital, but the largest number of cases commence between the ages of

five and thirty years. A well-marked hereditary tendency to the disorder has been sometimes observed. A syphilitic history has been noted occasionally. In a large number of cases no exciting cause whatever can be found; in some, however, the causal connection has been most close. Injury, and especially an injury to the head, exposure to cold, drinking cold fluids while heated, and an alcoholic debauch have been the most frequent determining causes of the disease. In a comparatively large proportion of cases the affection has ensued upon an acute febrile attack, while muscular effort and mental emotion have preceded a certain number of cases.

Treatment.—To limit the potations has no effect upon the disease, but greatly increases the distress of the patient. Valerian in large doses, given either as the powder or as the valerianate of zinc, has been apparently efficacious in some instances. Ergot also is highly spoken of by some writers. Nitrate of potash, nitro-muriatic acid, iodide of potassium, strychnine and pilocarpine have all been tried, and occasionally with success. Opium, while diminishing somewhat the thirst and diuresis, was found by Sir William Roberts to greatly aggravate the general discomfort. The constant current applied with one pole over the upper part of the spinal cord and the other over the loins or epigastrium has been used with success in a few cases. Attempts must be made to maintain the general health by tonics and nutritious food. The dryness of the skin can be relieved by warm baths, and the epigastric pain by warm and sedative fomentations. ROBERT MAGUIRE.

DIABETES MELLITUS. — By diabetes mellitus is understood a disease the main symptoms of which are marked and more or less persistent glycosuria, polyuria, thirst, debility and emaciation, and which has a tendency to a fatal issue.

Nevertheless, this, the type of diabetes mellitus, is united to simple glycosuria, a condition in which, although sugar is present in the urine, there is no serious or even observable departure from a state of health, by cases in which the patients, though in feeble health, are not conspicuously emaciated, but are distressed, rather than seriously endangered, by a diminished severity of the symptoms characteristic of the more grave disorder.

The condition above referred to as

simple glycosuria is described in the article on GLYCOSURIA.

Symptoms.—The onset of the disease is generally insidious. The patient's attention is only after some time directed to his state by experiencing great weakness or thirst, or possibly by frequent calls to urinate. Slowly the diabetic condition becomes more pronounced, the appetite is voracious, yet emaciation proceeds apace, the thirst is insatiable, the tongue becomes glazed, the skin dry and harsh, and an anxious and suffering appearance is impressed on the countenance. The urine still increases in quantity, its specific gravity rises, and the sugar contained in it is greater in amount. Occasionally the onset of the disease is sudden and its progress rapid, and in rare cases the symptoms may attain to a high degree of severity in even a few weeks. Unless the disease can be checked, the patient becomes still weaker, the circulation fails, and dropsy of the legs appears; finally, he dies from exhaustion, aided possibly by one of the complications which may arise at any stage.

Certain of these symptoms require fuller discussion.

The *urine* is greatly increased in quantity. The actual amount passed daily may vary from 5 to 6 pints, in very mild cases, to even as much as 25 to 30 pints, when the disease is severe. In the same patient, too, the amount of urine passed is variable. In the earlier stages of the disease the quantity is not greatly increased, and again as death approaches the excessive amount previously excreted is diminished. Similarly, too, less urine is passed when appropriate dietary rules are observed, and during an intercurrent febrile attack the total daily amount of urine may not exceed the normal. The quantity of urine is proportionate to the amount of fluid imbibed. Cases are exceptionally met with in which throughout the disease no very excessive amount of urine is passed.

Conditions similar to those just mentioned will also influence the percentage of sugar found in the urine, and during intercurrent febrile attacks the sugar has been observed to disappear completely. In addition, it must be mentioned that the amount of sugar is increased after meals, and markedly after the use of saccharine or amylaceous foods, while it is diminished by fasting. In mild cases, and in the earlier stages of severe cases the sugar may be

caused to disappear by abstention from sugar and starch in the diet; but in the later stages, and in all severe cases, its presence is persistent, though in diminished amount, in spite of a purely animal diet. The quantity of sugar is usually from 2 to 5 per cent., but may reach as high as 12 per cent. The total daily excretion of sugar ranges from 15 to 25 ounces, and it has been known to exceed 1000 grammes (= 2 lb.). The diabetic sugar gives the reactions of glucose, but levulose and inosite have also been found occasionally in small quantities. The specific gravity of the urine is increased; "it usually fluctuates a few degrees above or below 1040; it may rise to 1055 or 1060, or sink to 1015" (Sir Wm. Roberts). For the methods of testing the urine for sugar the reader is referred to the article on GLYCOSURIA.

The other constituents of the urine are increased as to their total daily excretion, though their percentage in the urine is diminished. Urea has been shown to be greatly increased. Uric acid may be deposited in reddish crystals, especially in the earlier stages of the disease. Teissier and, in this country, Dr. Ralfe, have drawn attention to cases in which the phosphates of the urine are greatly in excess, and sugar may or may not be simultaneously present. Yet all the symptoms of diabetes mellitus are found, and it has been proposed to term such cases "phosphatic diabetes." Leube has recently described glycogen as occurring in diabetic urine. The urine is usually very pale in colour when passed in excessive amounts, but of normal colour when the quantity is nearer the healthy standard. The spores and filaments of the yeast plant speedily develop in it when it is exposed to the air, and may form a whitish sediment. The reaction is faintly acid. Diabetic urine very often has a sweetish smell, resembling that of ripe apples. This is due to the presence of diacetic ether, which may be a product of β -oxy-butyric acid, also found in such urine, and may in turn give rise to the presence of acetone (acetonuria). Diacetic ether causes the so-called ferric chloride reaction of diabetic urine—viz., a purple red coloration when liq. ferri perchlor. is added to the urine in excess. The tests for these bodies are too complicated to mention here, and will be found described in the article upon URINE, EXAMINATION OF THE.

Thirst is one of the earliest symptoms

of diabetes: in most cases it is excessive, and may be almost unquenchable. The cause of the thirst is probably the presence of sugar in the blood, which needs large supplies of water to maintain it in solution and aid its transmission through the kidneys. The distress of the patient is greatly aggravated by any attempt to limit the quantity of fluid, but the excessive amount of fluid imbibed seems to increase metabolism, and so hastens the wasting of the body. It is to be noted that some patients complain but little of thirst, even though considerable quantities of sugar are passed; but the urine in such cases is seldom greatly increased in quantity.

An inordinate appetite is a frequent symptom of diabetes, but is more often absent than the sensation of thirst. Not infrequently in the course of the disease total disgust for food, or at least for such food as can be permitted, is experienced. The tongue is dry, red, and glazed, sometimes coated; the gums are prone to swell and bleed easily, and the teeth may become carious and drop out. In the later stages, apthous stomatitis is common. The saliva has often an acid reaction from the development of lactic acid. Digestive disturbances of various kinds are common, slight vomiting, flatulence, uneasy or even painful sensations at the epigastrium being frequently experienced. The bowels are as a rule confined, but towards the end of the disease obstinate diarrhoea may arise, and is to be regarded as a most unfavourable sign.

In the typical form of diabetes mellitus, *emaciation* is very pronounced, and rapid in its progress. All the tissues participate in the marasmus, the fatty constituents of the body being the first to disappear. The wasting persists in spite of the consumption of enormous quantities of food. Although much of the wasting is due to the profound changes in metabolism going on in the body, which will be mentioned in treating of the pathology of the disease, yet it is markedly controlled by the amount of fluid passing through the system, as indicated by the polyuria. When, under suitable treatment, the amount of urine is diminished until it nearly approaches the normal, the patient may not only cease to emaciate, but may even gain flesh. The pulse and respiration rates are usually normal, and, provided that no complications exist, the body temperature is usually below the normal. The sweet smell (acetone odour) mentioned above as

present in the urine is often perceived in the breath, and may be disagreeably intense. The skin as a rule is dry and harsh, but, on the other hand, abundant perspiration may be present throughout the course of the disease. The subcutaneous tissues are not infrequently œdematous. In the later stages of diabetes, the mental faculties fail to a pronounced degree. Not only are the mental processes carried on slowly, but there is great disinclination for mental exertion, and the temper becomes peculiarly irritable. Morally, too, a defect is noticeable, and patients, who in a state of health were notably truthful, will practise lying and deceit on the smallest provocation. The sexual powers tend to become abolished.

The symptoms described are those of the typical and most usual form of the disease. But cases are frequently met with which, while presenting individual symptoms of diabetes mellitus, do not show the complete picture described above. Thus, it is common to find that patients florid in complexion, and stout or even obese in habit, will pass large quantities of urine containing a considerable amount of sugar, and will complain of thirst. In such cases there may be a tendency to heart failure, and digestive disturbances are usually prominent. Yet no other symptoms of diabetes are observable, and emaciation may never ensue. A history of gout is to be obtained in many such cases, and copious deposits of uric acid may be found in the urine at times. This form of diabetes is prone to occur in the aged or middle-aged rather than in younger persons, who more often manifest the disease in its typical form.

Complications.—The complications of diabetes are numerous. Amongst the most frequent and serious are those which affect the lungs. That which is most usually met with is a chronic or subacute caseous pneumonia of tubercular origin. This begins by insidious infiltration of the apex, as is the custom with tubercular affections under other conditions, or may commence with ordinary pneumonic symptoms. It leads very rapidly to breaking down and excavation of the lung. Simple or non-tubercular pneumonia is also met with, and may be croupous or catarrhal in character. As a rule, it is acute in its course, but has been known to be chronic. All these inflammations of the lung in diabetes show a notable tendency to proceed to gangrene. It is a peculiar character-

istic, however, of diabetic gangrene of the lungs that the sputum and the breath have rarely the intensely fœtid odour which they present when no diabetes is present.

Numerous affections of the skin and underlying tissues are prone to occur in the course of the disease. Of these, boils and carbuncles are the most frequent, and have been long known to be of common occurrence in diabetic patients. Eczema and intolerable itching of the skin may torment the patient. These conditions occur in all parts of the body, but are most marked over the genital organs, and are especially frequent in patients of the female sex. Indeed, not infrequently the occurrence of pruritus, accompanied or not by an eczematous condition of the labia, is the first symptom of diabetes to attract the notice of the patient. Psoriasis and pemphigus may also be mentioned as rare complications of diabetes. Gangrene of the toes or of even greater portions of the lower extremities is not of uncommon occurrence, and usually resembles in character the dry gangrene found in old persons; its cause is, in most cases, obscure, but an obstruction of the arteries leading to the gangrenous part has been occasionally observed, and is probably due to sclerosis of the vessels.

Albuminuria is a common complication of diabetes, and may be due to a variety of conditions. It may result from a chronic irritation of the kidneys, set up by the passage of the saccharine urine through the glands. This leads in time to a sclerotic condition, with overgrowth of fibrous tissue, or to a chronic inflammation and fatty degeneration of these organs. In either case the complication has scarcely any influence upon the course of diabetes, and adds but little to the gravity of the prognosis. The same may be said when albuminuria, as occasionally happens, is the result of high pressure in the renal pelvis and tubes owing to the difficulty experienced in the transmission of the large quantity of urine into a hypertrophied and often distended bladder. But in certain conditions albuminuria is a grave phenomenon. It may be due to heart failure, and it may, again, accompany and even precede the most dangerous complication which can attack the diabetic—the so-called diabetic coma. When due to these causes, albuminuria is frequently the precursor of a fatal termination. Among minor complications which attack the urinary system may be mentioned pyelo-nephritis,

cystitis, urethritis, and, in the male, balanitis.

The cardiac failure so often observed in diabetes may be chronic in its progress, and apparently only a part of the general bodily weakness. The pulse becomes slow and feeble, and œdema of the limbs is prone to occur. It may, however, be acute in its onset and extreme in degree, and may give rise to most alarming symptoms, which are sometimes considered as constituting one variety of diabetic coma. Endocarditis has been observed in a few instances. In the digestive system, the only complication of importance is obstinate diarrhœa, which occurs sometimes as a late and often fatal trouble.

During recent years special attention has been paid to the numerous complications of diabetes which may arise in connection with the nervous system and its appendages. Defects of sight are common. That which has been most completely studied is opacity of the lens, or cataract. This occurs as a late symptom, and is generally considered an unfavourable indication as to the future duration of the case. It is of rapid course, and quickly affects both eyes. The cataract is most frequently of the soft variety. Its origin was at one time attributed to the direct action of saccharine fluid imbibed into the lens from the aqueous humour. Now, however, it is generally regarded as degenerative in nature, and as an indication of the low state of vitality of the tissues, other evidences of which condition are gangrene of the limbs and of the lungs. Operations for cataract in diabetes are seldom successful. Weakness of vision is also a common complaint amongst the sufferers from this disease. It is perhaps most frequently the result of a weakness of the muscles of the eye-ball, which interferes with accommodation. Such weakness may, in some cases lead to actual paralysis of one or more muscles, with strabismus and diplopia. Yet true amblyopia is of frequent occurrence, and in rare instances total blindness may ensue. Lesions have been observed, but they are not invariable, which explain the loss of sight, but it must suffice here to merely enumerate them—optic neuritis, retinitis, retinal hæmorrhages, retinal atrophy, and cloudiness of the vitreous. Iritis and keratitis sometimes occur.

Recently it has been observed that in many cases of diabetes the knee-jerk is wanting. This is a sign of a severe and

late phase of the disease, and its pathology is as yet obscure. It may be due to a peripheral neuritis, or to a generally depressed state of the spinal centres. Neuralgia affecting various nerves is extremely common in diabetic patients. Sciatica is thus a frequent symptom. On the other hand, however, diminution of sensibility is not unusual. Paralysis may affect individual groups of muscles, or may assume the form of hemiplegia.

But the most important and formidable complication which can affect the diabetic patient is **Coma**. This is a more common occurrence in young patients and in a comparatively early stage of the disorder, but those cases in which it appears are invariably severe. Often no exciting cause of this condition can be detected. Excessive muscular exercise, a mental shock, and the sudden assumption of an anti-diabetic diet have appeared to have a causal influence in bringing about the attack. The symptoms present themselves, as Dr. Dreschfeld has shown, in different groupings. Most frequently the patient complains for a little while of headache, epigastric uneasiness, nausea, or even vomiting. Then great restlessness and an anxious appearance are observed, which are soon followed by delirium and gradually deepening coma. A peculiar characteristic of the comatose state is an extreme dyspnœa affecting both phases of respiration, and styled by Kussmaul "air-hunger." There is no cyanosis, and no cause for the dyspnœa is revealed by physical examination of the chest. The muscles may twitch, but true convulsions are of very rare occurrence. The pulse is quick and feeble; the temperature is low. The pupils are usually, but not invariably, dilated. The urine is generally diminished in quantity and contains less sugar immediately before the attack than has been the rule in the preceding stages of the case. In the experience of the writer albuminuria is an invariable accompaniment and frequent precursor of the comatose state. The urine presents, in a marked degree, the sweet apple-like odour already described, and also gives the ferric chloride reaction. Moreover, when distilled after acidulation, acetone can be detected in the distillate by its usual tests, preferably by the addition first of liquor potassæ and then of a solution of iodine and iodide of potassium, when a precipitate of iodoform is produced. The breath also has the same odour, and has been shown to yield the same reaction of acetone when similar tests are applied.

Diarrhœa is occasionally observed in the comatose state, but there is more commonly constipation, and this, too, frequently precedes the attack.

In another form of diabetic coma the dyspnœa is not so marked, but there is drowsiness followed by gradually increasing coma. This condition is sometimes called the "apoplectic" form.

In a third class of these cases wild excitement is the more prominent symptom, and the condition may be mistaken for one of acute alcoholism. There may be, as additional sources of fallacy, a staggering gait and incoherence of speech. Soon, however, as in the preceding forms, drowsiness and coma supervene.

There is a fourth class of cases which is erroneously, but yet generally, included amongst the comatose forms, but is really the result of acute failure of the heart. Suddenly faintness is experienced, the pulse becomes rapid and feeble, pallor of the face and coldness of the skin are observed, and consciousness fails. In these cases the peculiar dyspnœa is wanting. All these forms of so-called diabetic coma are extremely dangerous to life, and recovery from them is of rare occurrence.

Morbid Anatomy.—No lesion has as yet been found in the bodies of diabetic patients which throws any light upon the nature of the disease. The liver, to which the attention is naturally first turned, has in the earlier stages been found enlarged and congested; in the later stages somewhat diminished in size and hardened. Microscopically, the liver cells may be quite normal, or may present minor digressions from the normal state. Glycogen has been demonstrated in their interior. The interstitial tissue is, in the late stages, increased in amount. Dr. Dickinson has described dilatation and congestion of the small portal vessels. The pancreas has been found hardened and atrophied. In the nervous system, also, Dr. Dickinson has described excavations in the white matter immediately surrounding the blood-vessels. The excavations may be empty or may contain remains of nerve matter and destroyed blood-corpuscles. These changes are found in both the brain and spinal cord. Other observers have, however, not found these changes so frequently as Dr. Dickinson has done, and it has been suggested that the appearances may be due to the mode of hardening the specimens. Spots of softening in various parts of the nervous

system are not uncommon. Sometimes, too, a gross lesion of the brain in the neighbourhood of the fourth ventricle, such as a tumour or hæmorrhage, may be found. In such a case the lesion has probably been the cause of the diabetic condition. The kidneys present lesions which have been already mentioned in discussing the albuminuria of diabetes. They may be sclerotic, or pale and fatty, or they may be distended, and, again, they may be congested. By suitable reagents the presence of glycogen has been demonstrated, especially in the cells of Henle's loops. In the kidneys of a patient dying from diabetic coma the cells of the convoluted tubes show the changes of coagulative necrosis. The cells are swollen, pale, and hyaline; they do not take staining fluids readily, and their nuclei are scarcely apparent.

The blood in diabetes is charged with sugar, and similarly sugar is found in all the fluids of the body. After death from diabetic coma, the blood has been found to be pale, more fluid than usual and to contain fat. Also, it gives off the peculiar sweet smell already mentioned, and on analysis has been found by various observers to contain acetone, di-acetic acid, di-acetic ether or β -oxybutyric acid. Probably the three first-mentioned bodies are products of decomposition of the fourth. Finally, the lesions due to complications are found in addition to those already described.

Ætiology and Pathology.—Diabetes is more common in males than in females, and more frequently attacks young adults and children than those more advanced in years. The milder form of diabetes which has been described is found for the most part in persons of middle age, and especially in those of obese habit. A gouty diathesis also favours the development of this form. An hereditary tendency to diabetes is frequently observed. Diabetes is more common in country districts than in towns. Persons of a neurotic temperament are found to be specially liable to the disease. Jews have been found to furnish a much larger proportion of patients than other races. Malaria, syphilis and pregnancy have been noted as predisposing causes. The exciting cause is frequently obscure. Exposure to cold, mental shock, injuries of the brain or peripheric nerves, and severe bodily exercise have preceded the outbreak of symptoms in some cases. Organic diseases of the brain, such as tumour, softening, and hæmorrhage, especially when affecting the region of

the fourth ventricle, are occasionally observed to be associated with polyuria and sometimes with glycosuria and other diabetic symptoms. The excessive use of starchy and saccharine foods, and the abuse of alcohol, will cause glycosuria and sometimes the more severe symptoms of diabetes, but such cases are generally easy of control.

A complete discussion of the *pathology* of diabetes would involve a consideration also of the views held with regard to the glycogenic function of the liver, and of the mass of arguments put forward by Bernard, Pavy, Seegen, Elstein, and others to support them. This would be far beyond the scope of the present article. All that can be attempted here is to give an outline of our present position, premising that, in spite of the careful attention and laborious research which have been devoted to the subject, the views of pathologists are as yet far from agreement.

The liver has for one of its functions the transformation of certain of the food stuffs into glycogen, a starchy material easily convertible into sugar by the action of ferments. All observers are agreed that the sugar absorbed from the alimentary canal is stopped by the liver, changed into glycogen, and so, at any rate for a time, prevented from reaching the circulation. Bernard believed that during healthy life the liver glycogen was being continually converted into sugar, and in this form carried off into the circulation to be used for the needs of the economy. Dr. Pavy, however, is of opinion that during health no such conversion takes place; that the function of the liver is not to convert the glycogen into sugar, but to prevent sugar reaching the circulation. In disease, however, the hepatic glycogen is, according to the latter view, abnormally converted into sugar: according to the former view, converted in greatly increased quantities. This excessive conversion of glycogen is believed to be due to a greatly increased flow of blood through the liver, whereby an excess of sugar is carried off, and a greater than normal quantity of arterialized blood is brought to that organ, such blood having been shown to possess great power of converting glycogen into sugar. In slight cases of diabetes, therefore, it is possible that, the liver having lost the power of transforming sugar into glycogen, the sugar passes on into the blood and is excreted by the kidneys, whilst, in more severe cases, dilatation of

the vessels of the liver, brought about by means of the vaso-motor system of nerves, leads to a greater supply of arterial blood to that organ, the result being an increased formation of sugar. The connection of glycosuria with diseases of the nervous system and with experimental puncture of the floor of the fourth ventricle is thus explained.

But the important and extended observations of Seegen have thrown new light upon the liver function. He confirms Bernard's view that sugar is continually being formed in the liver during health and poured out into the circulation. He also shows that amylaceous and saccharine foods are converted in the liver into glycogen. But he concludes that the glycogen of the liver takes no part in the sugar formation; that, in fact, the liver during life is constantly forming sugar out of the peptones absorbed from the alimentary canal. Diabetes is, according to this view, in its severe forms due to an increase of the destructive power of the liver upon proteids, a fact which goes far to explain the ravenous appetite and emaciation of diabetic patients; in its milder forms the liver function of converting sugar into glycogen is in abeyance, and the sugar obtains access to the general circulation in quantities too large for the organism to deal with.

Recent observations of Dr. Mitchell Bruce are of great importance, and tend to support Seegen's views. He concluded, from observations upon a marked case of diabetes, that (1) the diabetes was not due to mere transportation of sugar from the intestine, for, on removal of all saccharine and amylaceous materials from the diet, the patient still excreted 4000 grains of sugar a day, and that therefore the liver formed the sugar from nitrogenous materials. (2) Dr. Bruce observed that the glycosuria was controlled by morphine, but less so when the morphine was introduced subcutaneously than when given by the mouth, the conclusion being that the glycosuria was not due to a diminished destruction of sugar in the system, but to an increased influx of sugar into the blood. (3) He came to the conclusion that the excessive glycogenesis took place in the liver and not in the muscles and other viscera, because the administration of morphine reduced the sugar excretion, when it was introduced into the stomach and absorbed by the portal vein, even though the quantity used was insufficient to affect the nervous system, whereas

a larger dose, sufficient to affect the nervous system profoundly, when administered subcutaneously had but little effect upon the sugar excretion. (4) Dr. Bruce's final conclusion is that the seat of the disordered process, whatever may be its nature, is in the liver.

It has also been thought that some forms of diabetes are due to an inability of the system to use up the sugar. Dr. Rees asserted that diabetic sugar was not so easily oxidized as ordinary glucose, and Pettenkofer and Voit showed that diabetic patients absorbed less oxygen from the air and gave off less carbonic anhydride and watery vapour than healthy persons. These, however, are insufficient supports for such a theory.

Ebstein has formulated an original conception of the pathology of diabetes which, as yet, has received no support. According to his views, carbonic acid has the power of inhibiting the action of diastasic ferments, especially their action upon glycogen. Diabetes, he believes, is due to a defect of the protoplasm of the various tissues, by which too little CO_2 is produced. The glycogen of the body, in whatever situation it may be, is thus left exposed to the uninhibited action of diastasic ferments, and sugar formation consequently becomes excessive.

The pathology of diabetic coma is similarly obscure. The views held may shortly be summarized thus:—It is very generally believed to be due to a poison which circulates in the blood, but the nature of the poison is still a matter of dispute. It has been asserted to be acetone, di-acetic acid, or di-acetic ether, and the presence of all these bodies can be demonstrated in the blood by suitable methods. The researches, however, of Stadelmann would show that these substances are merely decomposition products of another body, which is probably β -oxybutyric acid, and that this is the true poisonous agent. It should be noted here that Dr. Ralfe had previously expressed the view that the symptoms of diabetic coma were those of an acid intoxication. Other theories which have been held are that fat embolism in various parts would account for the condition. Fat has been demonstrated in the blood, and fatty embolisms found in the lungs of patients who died of diabetic coma. Yet this does not explain the whole symptomatology. Similarly, the opinion that heart failure is the cause of diabetic coma, while true of certain cases, will not apply to all.

Course.—The progress, like the commencement, of diabetes is essentially gradual in the majority of cases. The typical cases last from one to three years, yet sometimes the disease is most rapid in its progress. Sometimes, too, after a sudden onset and rapid course for a short time, the symptoms abate in severity, and then assume the chronic course, which most commonly characterizes the disorder. While, as a rule, the disease steadily progresses towards the fatal end, cases occasionally happen in which intermissions are observed after the symptoms have been sufficiently marked and constant to remove all doubt as to the nature of the disease, but, as a rule, the more severe symptoms soon recur. Although, as already stated, recovery may occur in the milder forms of diabetes, the majority of well-marked cases die, the end being usually hastened by the presence of one or other of the complications which have been mentioned, and seldom due to simple exhaustion from the original disease.

Diagnosis.—The diagnosis of diabetes is rarely difficult. Nevertheless, it must be remembered that every case of glycosuria is not necessarily one of diabetes. Before the diagnosis can be considered as established it must be ascertained that the glycosuria is not a temporary condition only, that the urine contains more than a mere trace of sugar, and that some of the constitutional symptoms of diabetes are present.

Prognosis.—If the glycosuria occur in a patient of middle age, or at a later period of life; if there be a history of gout; if the patient be obese; and if the thirst, polyuria and other constitutional symptoms of diabetes be but slight, the prognosis is favourable. On the other hand, those cases in which emaciation is marked and rapid in its advance, and the constitutional symptoms are severe, only admit of an unfavourable opinion as to their issue. The results of treatment give an indication as to the further progress of the case, for when, on the assumption of an animal diet, the sugar disappears from the urine or becomes greatly diminished in quantity, and the polyuria lessens, it is probable that the case is not of a severe type, or is at least in an early stage. When, however, after all starchy and saccharine food-stuffs have been withdrawn, there is but little amelioration of the condition of the patient, the prognosis is very gloomy. The younger the patient the less likely is he to recover. Those cases, too, in which

some definite cause of the diabetes can be traced are more favourable than those in which the cause is obscure, provided, obviously, that the ascertained cause is not an organic lesion of the nervous system fatal in itself. The presence of the various complications above enumerated increases the fatal tendency of the disease. Attention may, however, be called to what has already been said as to the varying influence of albuminuria upon the progress of the diabetes according to the condition which gives rise to it. So few cases of diabetic coma have been known to recover that a fatal prognosis must almost necessarily be given when this complication presents itself.

Treatment.—It will be gathered, from the sketch of the pathology of diabetes which has been given, that the first effort of the physician must be directed to limiting the supplies from which the body may obtain or manufacture sugar. In the milder cases this will suffice to cure the disorder; in all but the very severe forms it will mitigate the symptoms and diminish the patient's distress. It is true that in severe forms of diabetes the liver has the power of transforming proteid matters into sugar, but to remove from the dictary those foods which contain starch or sugar nearly always lessens the amount of sugar which appears in the urine, and diminishes the amount of urine excreted. Strict directions must, therefore, in all cases be given to the patients to eschew those food-stuffs which contain sugar or starch. Nearly all animal foods, fish, meat, and fowl, may be permitted to the patient. Liver, however, is to be forbidden on account of the large amount of glycogen and sugar it contains, and similarly all molluscs are to be avoided, since the greater portion of their bodies is made up of liver. Cheese, butter, oil, including cod-liver oil, and eggs may be partaken of freely. Cream also may be allowed. Theoretically, milk should be harmful, but practically, if partaken of sparingly, it does no harm. Soups if not thickened with flour, and jellies if not sweetened with sugar, may be allowed. It is among the vegetable foods, however, that the greatest care is necessary in order to avoid those which contain starch and sugar. Bread forms such a large portion of an ordinary diet that its deprivation is one of the most severe hardships which must be inflicted on the diabetic. Yet it must be forbidden

entirely. Several substitutes have been suggested. Freshly made gluten bread is very generally used by diabetics. But much of the gluten bread sold contains a considerable quantity of starch, so that, if used at all, it should be obtained from well-known firms, such as Blatchley, Bonthron, or Van Abbott. Gluten flour, too, may be used as a thickening for soups. Bran cakes are another substitute for bread, and have the merit of being less expensive than the gluten preparations. Almond cakes, as devised by Dr. Pavy, are admissible, but are too costly for any but wealthy patients. The patient sometimes becomes disgusted with all these preparations, and it is then advisable to allow a small quantity of bread which has been toasted almost to a cinder. Sugar, of course, is to be forbidden, and with it, honey. Glycerine in small quantities may be used as a sweetening agent, or, again, the tabloids of saccharine recently introduced. In the writer's experience, however, saccharine has not been of so much use in diabetes as was expected. The patient, after its use, frequently complains of everything tasting sweet. Moreover, the diabetic does not crave for sugar as he does for bread, and soon becomes indifferent to its absence. Flour preparations, such as macaroni and vermicelli, potatoes, rice, sago, tapioca, arrowroot, peas, beans, carrots, beetroot, and parsnips, must be forbidden. Green vegetables, such as spinach, greens, turnip tops, lettuce, and watercress, may be eaten. Others, too, which contain a little sugar, such as asparagus, cauliflower, and cabbage, may be eaten if they have been previously boiled in a large quantity of water. Sweet fruits are to be avoided. Tea and coffee may be drunk, but no sugar must be added. Only a moderate quantity of alcohol can be permitted, and that must be taken in an unsweetened state. Sweet wines, liqueurs, and mild ales must be forbidden, but the patient may drink sparingly of bitter ale, dry sherry, claret, and whisky.

The patient must be clad warmly, so as to avoid all chills. Thirst may be allayed by acid drinks, the dilute phosphoric acid being specially useful for this purpose.

Many drugs have been lauded for their efficacy in diminishing the sugar excretion in diabetes, but of these a few only are of real service to the sufferer from this disease. Opium is of great value in diabetes, not merely for its anodyne effect, but for an actual curative influ-

ence upon the disease. Dr. Mitchell Bruce has shown that the best method of administering it is in the form of morphine, and by the mouth rather than subcutaneously. Dr. Pavy considers codeia to be preferable, in that it disturbs the digestion to a less degree than does the more powerful alkaloid. It is notable that diabetic patients exhibit a great tolerance of opium and its alkaloids.

Salicylate of soda has been found of use by many physicians, including the writer. During its administration, thirst and general discomfort have been alleviated, though no other positive effect on the disease has been apparent. A warning may be here given that the ferric-chloride test of the urine mentioned above cannot be used if the patient be taking salicylate of soda.

The general health must be maintained by tonics, such as quinine, strychnine, iron and cod-liver oil. Distressing symptoms should be treated on general principles as they arise. The bowels must be maintained in a state of daily activity by mild aperients or by small doses of the purgative mineral waters. Sir William Roberts recommends for the relief of the craving for food, and for the uneasy sinking sensation at the epigastrium, a pill containing 2 or 3 grains of assafœtida. Concerning other drugs which have been recommended, such as the bromides, arsenic in different combinations, belladonna, iodoform, lactic acid, and peroxide of hydrogen, it can only be said that, while individual physicians have written in high terms of them, the majority who have tried them have found them useless.

In diabetic coma treatment is of scarcely any avail. When preliminary symptoms are observed, smart purgation is recommended as a possible means of warding off the attack. During the attack good results have been recorded from transfusion of blood and from the injection of saline solutions into the blood-vessels.

A residence for a time at certain spas has been found of service in diabetes, and especially in those cases which are associated with a gouty diathesis. Carlsbad and Vichy are those most visited.

ROBERT MAGUIRE.

DIAPHORETICS are remedies which increase perspiration. They act in several ways—some by augmenting the flow of blood through the skin, others by direct stimulation of its afferent thermic nerves. Warm baths, the Turkish

bath, extra clothing, and alcohol act in one or other or both of these ways. Hot drinks stimulate the efferent nerves reflexly. Nicotine, opium, chloral, ether, chloroform, and alcohol act directly on the sweat centre. Pilocarpine acts especially on the peripheral nerves at their terminations in the sweat glands. Salines—*e.g.*, citrate and acetate of ammonium—probably stimulate the secreting cells of the sweat glands; whilst the mode of action of antimony, ipecacuanha, senega, and guaiacum is quite unknown. Substances which cause very profuse sweating are called sudorifics.

DIARRHŒA, ACUTE, FROM INGESTA.

Acute diarrhœa is the most prominent symptom of illness produced by eating articles of food which are undergoing certain peculiar processes probably allied to putrefaction. Milk, ham, pork pies, veal, fish, and sausages have been known to produce severe illness. Although not yet thoroughly worked out, it is clear that the ætiology and pathology of the affection vary much in different cases. Clinically, two classes may be formed—(*a*) in which the symptoms come on very soon (half an hour to a few hours) after taking the food, and are probably due to the presence in it of a chemical poison; (*b*) in which the symptoms set in after an interval of twenty or thirty hours or even several days. In the first class of cases the diarrhœa is profuse, watery, dark, and offensive. It is preceded by vomiting and acute abdominal pain, and accompanied by chilliness, a feeble pulse, a sub-normal temperature, great prostration, and sometimes by hallucinations. The tongue is furred; headache is not a prominent symptom. The amount of collapse is in proportion to the severity of the diarrhœa. In fatal cases, which are rare, death is due either to collapse or to the occurrence of complications. The chief signs observed after death have been gastro-enteric catarrh and congestion of the lungs, spleen, and kidneys.

In the second class of cases, where the interval between ingestion and the onset of symptoms is longer, the diarrhœa has the same characters, but is less easily controlled. Headache is a prominent and early symptom, vomiting is less marked, the tongue is thickly coated, but the tip and edges are red, the pulse is hurried, the diarrhœa is accompanied by great pain, and quickly produces prostration and cold sweats. Death may occur in this stage, but it is rare, the patient

generally passing into a condition of reaction, during which there is marked fever. Pneumonia is common, and parenchymatous nephritis may occur. Cases of this class are apparently due to infection by bacilli, which are also pathogenic to dogs and other animals.

Treatment.—The diarrhœa is, as a rule, comparatively easily controlled, a dose of castor oil, followed by a mixture containing bismuth and opium, or opium with rhubarb and other carminatives, being generally sufficient to check it. For a week or more after the cessation of the attack the patient is liable to a relapse should he commit any indiscretion in diet.

DAWSON WILLIAMS.

DIARRHŒA, ACUTE SUMMER.—This term is usually applied to acute attacks of profuse watery diarrhœa. Some of the cases are examples of diarrhœa from ingesta; others depend on the same ætiological conditions as cholera infantum (*q.v.*). The onset is usually sudden, colic being rapidly followed by very numerous stools, which retain a feculent character. A sinking sensation at the epigastrium, chilliness and general depression are always present, and in weakly persons may cause severe prostration.

The *treatment* is best begun with a large dose of castor oil with or without opium, if the case be seen early; at a later stage a mixture containing sulphuric acid, tincture of capsicum and a small quantity of opium, or a mixture containing small doses of castor oil (℥x-xx) and opium, or one containing chalk and catechu, or aromatic chalk with rhubarb and compound tincture of cardamoms is generally efficient. Abstinence from solid food and milk, and in bad cases confinement to bed, are important measures in treatment.

DAWSON WILLIAMS.

DIARRHŒA, CHOLERAIC.—This term has been used in various senses: it has been limited to diarrhœa occurring during the prevalence of cholera Asiatica, with which it has been supposed to have some premonitory or other relation. It has been extended to include every form of severe diarrhœa of sudden onset not easily traceable to any recognized cause. The pathology and ætiology of acute summer diarrhœa, of acute diarrhœa from ingesta, of cholera nostras and of cholera infantum are at present in a very unsettled state; they are discussed under their various headings.

DIARRHŒA, CHRONIC TROPICAL, the “hill-diarrhœa” or “white-flux” of India, the “diarrhœe endémique de Cochinchine,” is a severe form of chronic intestinal catarrh.

The earliest *symptom* is slight diarrhœa of a bilious character; the stools gradually become copious, light, and frothy, the tongue is sore, and there is progressive loss of strength. The changes in the tongue are especially characteristic; it is red, glazed and the papilla cannot be distinguished; painful ulceration of the tongue, lips and mouth generally follows; in extreme cases the mouth and tongue may be covered with an aphthous exudation. Subcutaneous fat disappears, the eyes sink, and all mucous membranes become blanched. Appetite is to a great extent retained, but the white frothy stools contain the undigested food. Unless there be a distinct malarial complication the temperature becomes subnormal. Albuminuria and œdema of the extremities occur at a late stage, and death is brought about by exhaustion.

The condition is to be *diagnosed* chiefly from chronic dysentery and from diarrhœa due to albuminuria or other causes; in distinguishing it from the former the history of the gradual onset, and in both the character of the stools—“the white-flux”—are of greatest value; only occasionally are the stools blood-stained.

The *morbid anatomy* of the disease is, in its early stage, a catarrhal inflammation leading to limited ulceration; in a later stage all the coats of the bowel become so wasted that it is transparent. The mucous membrane and solitary follicles may undergo albuminoid degeneration.

Pathologically the disease is allied to dysentery, but differs from it in its milder and more chronic course, in the more general affection of the whole intestinal mucous membrane, in the tendency towards wasting of the mucous membrane rather than to thickening, in the general absence of chronic ulceration even in the large intestine and in its greater amenability to treatment than chronic dysentery. The absence of any trace of bilious coloration of the stools has suggested that the primary fault is in the liver, but there is no post-mortem evidence of any change in that organ beyond the wasting, which the spleen and kidneys equally undergo. It is essentially a tropical disease, and has been most often observed in India, Burmah, Cochinchina and Java. It has gained the name of hill-diarrhœa in India owing to its comparative frequency

among persons who have passed from the great heat of the plains to the vicissitudes of temperature found in the hills. This fact has been held to prove that exposure to cold and damp, or sudden changes of temperature, are determining causes.

The *treatment* at the onset of the disease must be guided by the general condition; it may be necessary to give a saline laxative combined with ipecacuanha if there be hepatic congestion; if much colic and diarrhœa be present, small doses of laudanum or Dover's powder may be given. When the disease is established, the patient should be put on an exclusively milk diet; from 4 to 6 ounces being taken every hour. When the tongue ceases to be glazed, and the stools assume a normal appearance, beef-tea, meat juice, raw eggs and farinaceous food may be added to the diet, but milk alone may have to be continued for as long as six weeks before this stage is reached. In the later stages of recovery quinine and iron will be useful.

DAWSON WILLIAMS.

DIARRHŒA, INFANTILE, is a term which has come into use rather because infants and young children are extremely liable to attacks of diarrhœa than because the morbid changes have any special character. Various types may be distinguished as a matter of clinical convenience, but no hard-and-fast lines can be drawn.

Simple Catarrhal Diarrhœa.—The infant is suddenly taken with griping, quickly followed by watery motions, containing at first some feculent matter and undigested curds. The amount of general disturbance varies, the child is restless, the tongue is generally furred, and there may be distinct pyrexia, which subsides as the flux is established. Vomiting is common, caused by associated gastric catarrh. Such attacks are traceable either to errors in diet, or to exposure to cold, and the first point in treatment is to administer a mild aperient, such as castor oil (ʒi) or rhubarb and soda (āā grs. v, with powdered cinnamon); the belly should be kept warm with a flannel binder or a layer of cotton-wool, and the milk should be freely diluted or withheld altogether, being replaced by weak veal-broth; most cases yield readily to this treatment, but recovery may perhaps be hastened by the administration, for a few days, of an antacid mixture (*e.g.*, sodium carbonate and dill water). If the diarrhœa

continue, rhubarb and opium should be given (tinct. opii ℥ss, spir. ammon. aromat., tinct. rhei, spir. chloroformi āā ℥iij in dill or caraway water), or chalk and catechu. If the stools are frothy, the aromatic chalk powder should be given once or twice a day.

Acute inflammatory diarrhœa is a term which may be conveniently used to embrace the severer forms of simple catarrhal diarrhœa and the very numerous cases of summer diarrhœa which are closely allied to cholera infantum (*q.v.*) both in their ætiology and symptoms. The attack commences with griping, often accompanied by vomiting; the stools at first contain curds and the skins of plums or scraps of other fruit which the child may have been allowed to swallow, but they quickly become watery, offensive, and either brown or green in colour. In less serious cases, however, they may be pale and semi-solid. The general symptoms are severe; the temperature as a rule is raised, and may reach 106° or 107° F. in the rectum; the pulse is hurried and weak, the skin harsh and dry, the face sunken, the lips parched, and the tongue red, small, and rather dry. If, however, gastric catarrh be present, the tongue is furred, and vomiting is a prominent symptom.

The *diagnosis* from enteric fever is often difficult, and not always possible at first; the severity of the early diarrhœa, and later the absence of enlargement of the spleen, assist in the diagnosis, which is confirmed by the early cessation of the symptoms in favourable cases. In protracted cases, the aspect of the child—drowsy, impassive, with rapid irregular pulse, pinched features, inelastic skin, and half-closed eyes—some-what resembles that seen in advanced tubercular meningitis, and to this condition the term “spurious hydrocephalus” has been applied. The depression of the fontanelle, the low or subnormal temperature, and the history of the illness, usually make the diagnosis clear.

Owing to the great exhaustion which is rapidly produced, especially in weakly children, a guarded *prognosis* must be given; unfavourable symptoms are continuance or marked increase of the pyrexia, early collapse, violent vomiting, and very frequent watery stools.

The *pathology* is probably not the same in all cases; in some the catarrh is excited by decomposing food, in others by exposure to cold, and in others again it is traceable to miasmatic influences (*see* CHOLERA INFANTUM). The catarrh is

not uniform; it is most commonly seen in the jejunum, and in the ileum just above the cæcum, where shallow ulcers are often present. Occasionally minute patches of false membrane give the mucous membrane an appearance resembling that which would be produced by sprinkling it with bran.

The disease is most often seen in hand-fed infants, and in these the first step in *treatment* is to entirely exclude milk from the diet, which should be restricted to veal or chicken broth, or whey and barley-water; konmiss in small dose is sometimes useful; the food must be given in small quantities. The belly must be kept warm by a covering of cotton-wool retained by a flannel binder, and the child nursed by a competent person in a well-ventilated room. If the temperature continue high, recourse ought to be had to cool or tepid baths (about 70° F.), administered with caution; when prostration comes on, stimulants must be given, good brandy being the best; warm mustard baths may be employed. At the onset it is advisable to give a dose of castor oil, and this may be followed by ipecacuanha and opium with a carminative (℞ Tinct. opii ℥ss, tinct. zingiberis, vin. ipecac. āā ℥ij, aquam ad ℥ss, every three or four hours). When the stools are green, dilute lactic acid may be added with advantage. In acute summer diarrhœa the perchloride of mercury (gr. $\frac{1}{3}$) frequently repeated is sometimes effective. Astringents are not of much use until the temperature has fallen to about 100° F.; the vegetable astringents are generally to be preferred, and either the extract of hæmatoxylon (grs. ij or iij), the extract of rhatany (grs. ij or iij), or the tincture of catechu (℥iv to ℥viij) may be combined with aromatic chalk and a minute dose of opium; in some cases aromatic sulphuric acid (℥iv) combined at first with opium is very useful.

Chronic inflammatory diarrhœa is often observed as a sequel of an acute attack, but may arise insidiously; the wasted and anæmic condition of the child being the first thing to attract attention. The child will be found to be liable to frequent attacks of diarrhœa, the stools being thin, foul, and of a dark-brown colour; sometimes they contain a peculiar green material like chopped spinach. In the intervals between these attacks three or four pale, copious, offensive, semi-solid stools are passed daily. The belly is distended by flatus, the appetite is capricious, being often voracious,

but the general nutrition fails. To this condition the term "consumption of the bowels" is often applied, but a careful physical examination will usually distinguish it from tubercular disease. The intestines contain patches of chronic catarrh; the mucous membrane is of a dark-grey or dusky-red colour, enlarged follicles project on the surface, and ulceration more or less extensive, but always superficial, commonly exists in the ileum.

The *prognosis* must always be guarded, especially among the children of the poor in large cities.

The most important points in *treatment* are food and clothing; milk, even diluted with lime-water and barley-water, can seldom be digested, and must be replaced by broths, whey, and barley-water, and good malted food made with whey. Children above one year generally do best on a diet mainly consisting of raw meat and thin bread and butter, or raw meat and jelly. Drugs are very uncertain in their action. During an exacerbation, if the stools are brown and offensive, phosphate of soda (grs. v to viij) with laudanum (℥ss) sometimes succeed; in other cases an aromatic mixture containing rhubarb and the above dose of laudanum will be of use. Pepsin (grs. iij) or papaine (Finkler), administered three or four times a day shortly after a meal, is most successful in many cases. In all cases, but especially in those associated with rickets, cod-liver oil in small doses should be cautiously tried, guarded at first by opium, and it is often surprising to note how soon it is well taken.

Lienteric diarrhœa is a form of diarrhœa not often observed in infants, but common in children over two years of age. Each meal is quickly followed by griping pains, which do not cease until a fluid motion, generally containing scraps of undigested food, is passed. It appears to arise from an undue irritability of the peristaltic apparatus, and is associated with chronic gastro-intestinal catarrh. In children it is best treated by attention to the clothing of the abdomen, and the administration of a mixture containing minute doses of arsenic, nux vomica and opium; an alkaline carminative with a minute dose of opium may be given to an infant.

Dysenteric diarrhœa, using this term to signify the symptoms produced by a catarrhal inflammation of the large intestine, is a very common disorder of children in temperate climates; it is sometimes incorrectly spoken of as dysentery.

In its acute form the symptoms are tenesmus and colic followed by severe straining at stool, the motions passed consisting largely of mucus, the faecal matter being often well formed; the lower part of the rectum is often prolapsed with each stool, and it may be difficult or impossible to return it. The general condition of the infant or child quickly deteriorates owing to pain, irritability and pyrexia, and the *prognosis* is grave if the prolapse and tenesmus be not quickly relieved. There is a general catarrh of the mucous membrane of the large intestine, and shallow ulcers, which are at first circular, but later become irregular, are commonly present. In chronic cases the general symptoms are those of ordinary chronic inflammatory catarrh, but the stools contain large quantities of slimy mucus, easily recognized; tenesmus is a prominent symptom, and prolapse of the rectum is common.

In the *treatment* of these cases in the acute stage, in addition to the general remedies above recommended, medication should be directed to the lower bowel. A small starch enema (3ss) containing 3 or 4 minims of tincture of opium may be given twice a day, and a thick starch poultice applied over the prolapsed bowel. In the chronic stage astringent tonics by the mouth, and enemata containing catechu or rhatany injections are useful. Marked excess of mucus in the stools is an indication for small doses of castor oil guarded by opium.

DAWSON WILLIAMS.

DICROTISM.—When a second beat of the pulse can be perceived by the finger, the pulse is said to be dicrotic. This second beat is almost always the great secondary wave which follows immediately upon the closure of the aortic valves, and is generally supposed to be a wave of recoil caused by this closure, and reinforced by an oscillation set up in the aorta. The conditions most favourable for the production of the dicrotic pulse are a left ventricle acting powerfully with a low state of arterial tension. (*Vide* PULSE.)

DIGITALIS, Poisoning by.—All parts of the plant are poisonous. Poisoning is more commonly the result of repeated doses than of a single large dose. The *symptoms* come on very soon, vomiting being the chief; very often there is also purging and pain in the abdomen; thirst, noises in the head, suppression of

urine, clammy sweats and dilated pupils are commonly observed, but the condition of the pulse is the point of chief importance. At first it is increased in frequency, but soon becomes slower, until ultimately the beats are much fewer than normal. Death often occurs suddenly from syncope.

Post-mortem Appearances.—Nothing very definite may be discovered. The right side of the heart may be distended, the left empty; the blood is generally dark and fluid; the stomach may be congested.

Treatment.—Vomiting should be encouraged by emetics, and the stomach-pump should be used. Stimulants and hot tea or coffee, or 20 grains of tannic acid in hot water, may be given frequently. Aconitia gr. $\frac{1}{15}$ has been recommended for hypodermic administration as an antidote. It is essential to keep the patient in a recumbent position until some time after all symptoms have passed off.

DIPHTHERIA.—An acute, infectious and contagious disease, the chief characteristic of which is the development on the mucous membrane of the pharynx, nose and larynx, and on abraded surfaces, of a fibrinous exudation or *false membrane*.

Symptoms.—The onset may be almost sudden, but is more often insidious, the period of incubation usually lasting from two to seven days. The first symptoms are a slight feeling of indisposition, headache, with some fever, stiffness of the neck, and tenderness about the angle of the jaw, pain on swallowing, and a sore throat of a not very acute character. The mucous membrane of the soft palate and tonsils will be found reddened uniformly or in patches; soon a few whitish-grey spots are seen near the base of the uvula or on the tonsils. Gradually the spots coalesce to form patches, the patches run together, and at the same time become thicker. The whole of the soft palate and tonsils may thus be covered with a thick greyish or yellowish white layer, which may envelop the uvula like a finger-tip.

At first the exudation is not very adherent, but as it grows in thickness it becomes more firmly attached, so that when the whole membrane is formed it cannot be removed without some force, and leaves behind a raw and bleeding surface, on which it is speedily reproduced; if left to itself it gradually gets loose and comes away. The membrane is more

closely adherent to the tonsils than to the palate. Sometimes no definite membrane can be seen, the parts being simply swollen, and of a dull greyish colour. The membrane often extends into the cavity of the nose; indeed, it is rare not to have some nasal discharge. Epistaxis is of occasional occurrence, and may in rare cases prove a source of danger or even be the cause of death. The disease may also spread along the Eustachian tube, causing otitis, or along the lachrymal duct, and set up conjunctivitis. The so-called diphtheritic ophthalmia, however, has nothing in common with diphtheria, being simply a chronic membranous inflammation of the conjunctiva. The membrane may either spread to the larynx or the disease may attack that part primarily, a condition to which the name "croup" used to be and is, by some few writers, still applied. It may be surmised that the larynx is affected when hoarseness, stridulous breathing, dyspnoea, aphonia and recession of the chest walls make their appearance. If possible a laryngoscopic examination should be made, but this cannot always be done in the case of young patients, and it is not advisable to persist should the patient struggle much. The younger the patient the more likely is the larynx to be the part primarily attacked; such, indeed, is the rule in infants under two years.

At an early period of the disease the glands in the neck become enlarged, the gland at the bifurcation of the carotid a little behind and below the jaw, being the first affected; the neighbouring glands and peri-glandular tissues subsequently suffer, and a considerable swelling of the whole side of the neck may result; the enlarged glands are more or less tender.

The membrane gradually takes on a brownish tint, and the breath obtains a peculiar sweetish and very unpleasant but characteristic smell. There is not much fever, the temperature in some cases being scarcely raised, but it may reach 102° F. The pulse is generally increased in frequency and the heart's action weakened. In all cases of diphtheria the state of the pulse should be most carefully noted; sometimes it becomes extremely infrequent—a sign of bad omen. The bowels tend to be constipated; vomiting is rarely present, but is an unfavourable sign. Albuminuria will be found in a considerable proportion of the cases; the urine also often contains blood-corpuscles and epithelial casts; general anasarca is, however never ob-

served, except when scarlet fever has preceded the diphtheria.

The duration of fatal cases is generally a week or ten days; recovery in a mild case will often be assured before the end of the first week. Twelve days would be a safe term of quarantine for a person who had been exposed to diphtheria; after an attack he should not be allowed to go amongst the healthy in less than three weeks from apparent convalescence. One attack affords no absolute protection against subsequent infection, although it rarely happens that an individual is twice the subject of the disease. Some persons, however, seem to be more predisposed to it than others. It is safest to regard all forms of acute membranous inflammation as diphtheritic, and to treat them accordingly.

Sequelæ.—Certain phenomena referable to the nervous system are apt to follow an attack of diphtheria. They are loss of voluntary power, distributed over the whole body, most constant perhaps in the palatal muscles, and generally accompanied by anaesthesia of the soft palate; sometimes there is a certain amount of general anaesthesia. There may be loss of the knee jerks, and occasionally of the superficial reflexes. Loss of accommodation is an early symptom, and one almost pathognomonic; strabismus and ophthalmoplegia externa may also occur.

The speech is indistinct and nasal, fluids return through the nose, and the patient cannot drink without coughing and choking. The degree of loss of power may vary from a mere slight debility to absolute helplessness. Sometimes the gait is decidedly ataxic. The pulse, especially in the early stages, is liable to be weak and irregular, and cough is often present. Paralysis of the muscles of the neck and of the intercostals or diaphragm is far from uncommon, and the involvement of the latter is of serious import, as, owing to the inability of the patient to fix his chest, the cough becomes feeble and ineffective. Paralytic sequelæ are rarely seen before the third week from the onset of the diphtheria or after the sixth week in children, but in adults they may appear much later; indeed, in children the whole affection seems to run a sub-acute course, in adults a chronic one.

The gravity of the complication will depend almost solely on the implication of the chest walls; if these are affected, then a very little pulmonary catarrh will render recovery doubtful. The loss of

the knee jerks and the paralysis of accommodation would appear to be the earliest symptoms, but an excessive knee jerk has sometimes preceded its disappearance. In a few cases some of the muscles have presented the reaction of degeneration, and this has persisted after convalescence was well established. In the majority of cases of diphtheritic paralysis recovery takes place, but the prognosis must be guarded, as a considerable number die, and there is reason to think that the paralysis may in a few instances be permanent, but this has not yet been proved. Albuminuria is sometimes found after an attack; presumably it is a relapse from a nephritis which took place during the diphtheria.

Diagnosis.—In a well-marked case this presents little difficulty, but it is not always easy to distinguish between follicular tonsillitis and diphtheria, or to definitely exclude a diphtheritic element in some cases of tonsillitis. If the onset of the disease be sudden, the temperature high (103° – 104° F.), the tonsils much enlarged and the membrane upon them in patches corresponding to the crypts, and if the enlarged cervical glands be tender, the case is probably one of follicular tonsillitis. The absence of membrane or of albuminuria is by no means inconsistent with diphtheria. The diagnosis of the laryngeal cases in the absence of any membrane on the fauces is often exceedingly difficult; even a sudden onset of symptoms in the middle of the night is not conclusive against diphtheria.

Prognosis.—The danger will, as a rule, be directly proportional to the youth of the patient. The extension of the membrane down the trachea and into the medium-sized bronchi, an event which may occur even after the performance of tracheotomy, is perhaps the complication most to be feared. Sloughing of the wound after tracheotomy is also not uncommonly a cause of death in diphtheria. Occasionally mediastinal emphysema occurs from the rupture of alveoli, or the air enters the thorax along the deep cervical fascia after tracheotomy. Cases in which the nose is much involved also frequently terminate fatally. The condition of the heart is of great importance in forming a prognosis. As has been already stated, vomiting is of very bad augury, as also is the presence of a large quantity of albumen in the urine. Every complication adds to the danger, and even when the patient is safely through the diphtheria there are the great risks of subsequent paralysis to be encountered.

However mild the case may apparently be, the prognosis, therefore, should be a guarded one.

Morbid Anatomy and Pathology.—In a recent case of diphtheria on post-mortem examination, membrane may be found on both aspects of the soft palate and uvula, and in the larynx, but it is rarely directly continuous from one spot to the other. The membrane may be found in the trachea and the bronchi; not, however, often beyond the second division of the tubes, but a thick muco-purulent secretion can be traced into the finer tubes. The lining membrane of the larynx, trachea and bronchi will be found reddened beneath the membrane. The membrane is never so adherent in the air passages as in the fauces, probably owing to differences in the character of the two surfaces.

Membrane is occasionally found in the cesophagus, and still more rarely in the stomach. Micro-organisms may be found in and beneath the membrane, and even penetrating the apparently healthy tissues, but no special form peculiar to diphtheria has as yet been recognized. The heart, especially in those cases which have proved fatal through syncope, may show granular degeneration somewhat analogous to that met with in enteric fever, and sometimes minute thrombi will be found amongst the columnæ carneæ; in a few instances there has been endocarditis apparently of recent date. The kidneys in those cases in which albuminuria was present show the changes of sub-acute parenchymatous nephritis. Certain changes have been found in the grey matter of the spinal cord and in the peripheral nerves, but the exact pathology of diphtheritic paralysis is still doubtful; the lesion must of necessity be slight, since recovery is usually so complete; the fatal result is determined, not by the character, but by the situation of the lesion. The mildest attacks, of which little or no notice has been taken, are perhaps the most apt to be followed by paralysis.

Etiology.—It has been contended that diphtheria is primarily a local disease, but this is hardly compatible with the fact that in many cases the general symptoms are quite out of proportion to the local; and it is now looked upon as a specific disease, with a special tendency to affect the throat. The disease is certainly communicable, and probably depends upon the presence of a micro-organism, but the exact nature of the latter is still uncertain. Diphtheria

has appeared in some cases to be due to polluted water, bad drainage, or foul air, and it is certain that it may be transmitted by milk. Cases are especially common amongst those living in mews or in the immediate vicinity of stables, and there are reasons for thinking that it is sometimes transmitted from animals to human beings.

Treatment.—The membrane should not be forcibly removed. Ice is an excellent local application, and the patient should be encouraged to suck ice. Drugs may be applied locally in the form of powders or spray; iodoform and carbolic acid may thus be applied to the fauces every four hours with great advantage, or solutions of carbolic acid (grs. iijss-5j), tannic acid, or perchloride of iron may be applied with a brush. Good results have followed the use of the liq. hydrarg. perchlor. as a spray and throat wash. The spray and powders have the advantage that in laryngeal cases the remedy, being to a certain extent inhaled, also reaches the larynx. When there is much swelling of the neck, nothing does so much good as ice compresses; they should be changed every two hours.

Internally, quinine, strychnine, perchloride of iron, and chlorate of potash are the remedies most in favour; the dose should be small, and the medicine given every three or four hours. The internal use of calomel in doses of from 2 to 5 grains, every two or three hours until free catharsis is produced, has many advocates and has certainly given good results in the hands of some practitioners. It is all-important but a matter of considerable difficulty to get the patient to take a sufficiency of nourishment. When there are any signs of cardiac failure, stimulants must be given freely.

Tracheotomy will often be necessary; the indications for the operation are inspiratory recession of the intercostal spaces and increasing dyspnoea. Intubation of the larynx has been practised, but rarely with as satisfactory results. The patient should be kept in bed and given a liberal supply of nourishment for at least a week or ten days after the membrane has disappeared in order to diminish the risk of paralysis, which undoubtedly is far more liable to follow a neglected diphtheria than when the patient has been carefully nursed. In the treatment of diphtheritic paralysis absolute rest in bed and protection from draughts are of the first importance; a liberal diet is equally necessary. If the palate be

much involved, the patient should be fed through the mouth or nose by means of a tube. Belladonna is the only drug that has seemed to exert any definite influence, and a trial should certainly be given to it in all serious cases.

JOHN ABERCROMBIE.

DIPLOPIA, or double vision, is a condition which necessarily results when the axes of the eyes are not parallel. It is often due to some error of refraction, and always accompanies paralysis of one of the extrinsic muscles of the eyeball, and is often an important symptom in disease of the brain or spinal cord. Diplopia may exist without there being any recognizable degree of squint. Defects in the lens may give rise to double vision with one eye alone; it is uncertain whether a lesion of the higher centres in the brain on one side only can produce double vision with one eye.

DISINFECTION (including Disinfectants; Germicides; Antiseptics; Deodorants).—The destruction of the contagium of infection.

The views held as to the nature of the infection which is to be destroyed must necessarily influence the selection of the method.

It is admitted that the virus of many infectious disorders is due to the action of a living *materies morbi*, in the form of microscopic germs—"microbes"—which live and multiply within the tissues of the patient. But this has, as yet, been proved to be the case in only a comparatively small number of diseases. In the present state of our knowledge, therefore, we must allow that there may be infectious maladies the contagium of which is not microbic, although capable of being destroyed if attacked in the proper way. Upon either view, disinfection needs to be thorough; for, if partial and incomplete, it is worse than useless, deluding with a false sense of security.

In this connection it should be remembered that a true *disinfectant* is an agent which destroys the contagium of infection; a *germicide* is a substance which, when added, in not less than a certain proportion, to a culture of the particular microbe under observation, kills both it and its spores outright; the term is not synonymous with disinfectant, since there may be infectious poisons not due to the action of "germs."

Antiseptics are agents which arrest decomposition (*sepsis*); but (1) this arrest may occur only so long as the decom-

posable material is submitted to the inhibiting action of the antiseptic; or (2) the antiseptic employed may suffice to destroy the fully developed septic microbes without destroying the vitality of their spores.

Deodorants are more or less fragrant substances which certainly mask the evil odours that commonly attend septic processes; but this substitution of a pleasant smell for a disagreeable one is no guarantee that the actual poison which the bad smell served to indicate is destroyed.

In the order of their hygienic value, then, these substances would rank thus:—(1) Deodorant—uncertain, dangerous, and delusive; (2) Antiseptic—locally useful so long as the action is maintained; (3) Germicide—valuable, and safe when the virus is microbic; (4) Disinfectant—certain and safe under all circumstances when used in the proper way.

Disinfectants can be classified in accordance with their mode of action, as—A. Oxidizing agents, including (1) those which oxidize directly, *e.g.*, ozone, potassic permanganate, &c., and (2) those which oxidize indirectly by the abstraction of hydrogen, *e.g.*, chlorine, chloride of lime, &c.; B. De-oxidizing agents, *e.g.*, carbolic acid, sulphurous acid gas, &c.; and C. Substances which destroy the pathogenic virus by some other form of physical action, *e.g.*, corrosive sublimate, heat, &c.

It is obvious that the members of groups A and B must not be used together, since their modes of action are chemically antagonistic; thus, carbolic acid may be employed in conjunction with the fumes of burning sulphur, but neither should be used with Condyl's fluid, chlorine gas or sanitas.

The contagia of the various forms of infection vary greatly as regards their virulence and their power of resistance to destructive agencies; the spores of *bacillus anthracis* and the virus of scarlatina are tenacious of vitality, whilst the infection of measles is short-lived and can be destroyed by free exposure to fresh air and bright sunshine.

As soon as an illness is proved, or even suspected, to be infectious, the patient should be isolated, preferably in a separate building, or, if this be impossible, in a room at the top of the house. Outside the door of this room a sheet moistened with some volatile disinfectant should be hung (*vide infra*). No persons should enter the room save the nurse and the doctor, and any articles which must

be removed during the illness (*e.g.*, crockery and soiled linen) should be previously immersed in a disinfecting solution. The sick-room should be light and airy and should have an open fireplace. All superfluous furniture, together with curtains, carpet and hangings, should be removed, and the room should be cleaned, aired and warmed before it is occupied by the patient. The water-supply and the rain-water pipes should be looked to; drains, cisterns and sinks must be examined, tested and kept continuously disinfected. The sick-room should be kept well ventilated.

But the treatment of a case of infectious illness is incomplete unless adequate measures be taken for the efficient disinfection of the patient and of his excreta; of the clothing, bedding and furniture with which he has been in contact; and of the sick-room itself. The following list includes all those measures which are practical and serviceable to this end.

For the disinfection of—

THE PERSON.—*The mouth* may be rinsed with a weak solution of Condyl's fluid (5j to Oj), to which a little eau de Cologne may be added; or with a solution of peroxide of hydrogen, or boroglyceride (1 in 100). *The skin* in scarlatina may be daily anointed with carbolic oil (1 in 60), or with 1 part of sanitas oil to 20 of olive oil; in the later stages of desquamation a lanoline ointment containing 1 per cent. of carbolic acid is useful; it may be sponged with a tepid solution of sanitas or of Condyl's fluid, or washed with carbolic soap (10 per cent.), sanitas soap, or lanolin-carbolic soap. When a disinfecting bath is given, care should be taken to thoroughly cleanse the nails, scalp, hair and all the orifices of the body; after such a bath the patient should put on fresh, clean (disinfected) clothing. In diphtheria all wounds and abraded surfaces should be protected by smearing them with carbolized vaseline (1 in 40), if they cannot be sealed with styptic collodion.

What may be termed prophylactic disinfection consists in the treatment of persons who have been exposed to infection with drugs which are supposed to destroy the infective virus as it enters the body, or to prevent its development; thus good results are claimed for the administration of small doses of arsenic and of the biniodide of mercury with potassic iodide, during the prevalence of scarlet fever epidemics. *Cabs*, which have been used for the conveyance of infectious

cases may be disinfected with chlorine or with sulphurous acid gas (*vide infra*).

THE EXCRETA. — *Feces, urine and sputa* should be received into vessels containing a teacupful of a solution of carbolic acid (3iv to Oj of warm water), chloride of lime (1 lb. to Oj), Condy's fluid (3j to Oj), sulphate of iron (green copperas) (1 lb. to Oj), chloralum or sanitas. Similar solutions should be used for flushing and disinfecting drains, sinks, water-closets, and for rinsing dirty utensils and crockery before washing them in hot water.

CLOTHING, FURNITURE. — Every infected article which is useless or can be spared should be burnt. Carpets, curtains, bedding, other than linen, including blankets, mattresses, bolsters, pillows and woollen clothing, should be exposed in a proper apparatus to heat. If dry air be employed, the exposure should be such that the centre of the bulkiest articles is maintained at a temperature of not less than 220° F. for at least one hour. In disinfection by steam, a temperature of 212° F. for five minutes suffices (Dr. Parsons). It would be useful to enclose a fragment of a fusible alloy which melts at the minimum temperature desired in a glass tube, and to place this in the centre of the bulkiest article requiring disinfection (*e.g.*, a mattress). This could be withdrawn and examined when the process was completed, and the fusion of the alloy into a button would prove that the mattress had been exposed throughout its mass to the required temperature. Linen and cotton articles should be quickly rinsed in a solution of chloride of lime (3j to Oj) or of Condy's fluid (3jss to Oj), then at once wrung out in clean water, and *boiled* at the wash. During the illness, clean soft rags should as far as possible be used instead of pocket-handkerchiefs and napkins, and burned directly they are soiled. Furniture and floors should be washed with a tepid solution of carbolic acid, Condy's fluid, or chloride of lime, and then scrubbed with hot carbolic soap and water.

THE SICK-ROOM. — During the illness, the sheet suspended outside the door must be kept moist with solutions of carbolic acid or sanitas. The room may be sprayed with sanitas solution, or with diluted Condy's fluid, several times a day. After the convalescent has left the room, and when the bedding and other infected articles have been removed, the room is to be disinfected by the use of chlorine or by the fumes of burning sulphur.

When chlorine is to be used, all windows, doors, and other openings having been closed—as directed below—and metal surfaces having been smeared with oil or vaseline, half a pint of hydrochloric acid is poured on to a quarter of a pound of manganese dioxide placed in a large dish elevated on a table in the centre of the room. The room must remain closed for six hours before fresh air is re-admitted and the walls and furniture washed. Chlorine bleaches, and this method is less convenient than the employment of sulphurous acid gas. In order to make efficient use of this latter agent, windows, ventilators, and fire-places must be tightly closed, slips of paper pasted over cracks and a sack of chaff or shavings stuffed up the chimney. It is important to see that enough sulphur is used; the proportion recommended by Parkes is 1 lb. of sulphur to each 1000 cubic feet of space; the sulphur should be divided into two portions or more if the room be a very large or long one. The roll sulphur, previously broken into small lumps, is put into an iron or tin dish large enough to hold it all when melted; this dish is placed on a brick or otherwise supported in an iron pail or stout earthenware pan, and some water or sand is placed in the bottom of this pan to receive any molten sulphur that may run over. The sulphur is most easily lighted by igniting spirit of wine previously poured over it. The door is then closed for from eight to twelve hours. At the end of this time the room may be cautiously entered, the windows opened, the fire lighted and the walls and furniture washed with the dilute carbolic acid solution, or with hot water and carbolic soap.

If their disinfection cannot be otherwise ensured, articles of clothing and linen may be suspended on lines stretched across the room before the sulphur is ignited, but the sulphur fumes bleach vegetable dyes and, by forming sulphuric acid with the oxygen and moisture of the air, are apt to rot the fibre of substances exposed to their action for any length of time. The various disinfecting "cones" supplied by the Chemical Carbon Company afford a ready but slightly more expensive means of practising the same method of aerial disinfection.

Should a case of infectious disease terminate fatally, the body should be washed with strong carbolic solution (1 in 20), and may also be sprinkled with MacDougall's or with carbolic powder; it

Disease.	Isolation of the Patient until—	Quarantine, after Exposure to Infection, for—
Chicken-pox .	Every scab has fallen off . . .	Eighteen clear days.
Cholera . . .	Convalescent	One week.
Diphtheria .	Convalescence is completed (in any case for not less than three weeks), there being no longer any sore throat or discharge from throat, nose, eyes, or ears, and no albuminuria.	Not less than ten days, if the throat be <i>quite</i> natural in appearance at the end of this time.
Enteric fever (Typhoid)	Appyrexia is established and all secretions are natural.	Not less than ten days.
Measles . . .	Not less than three weeks have elapsed from the appearance of the rash, and all cough and desquamation have ceased.	Sixteen days.
Mumps . . .	Not less than four weeks have elapsed, and all glandular swellings have subsided.	Twenty-four days.
Relapsing fever	Convalescence is completed . . .	Twenty-four days.
Ringworm of body	Cure is complete	Until careful and thorough examination has proved the absence of infection.
Ringworm of scalp	Careful examination of the whole scalp shows a complete absence of diseased hairs and stumps.	Until careful examination has shown complete absence of all signs of the presence of the fungus, followed by thorough application of an efficient "preventive" ointment or lotion.
Rötheln (German measles)	The end of second or third week, according to the severity of the attack.	Sixteen days.
Scarlatina .	The end of sixth week from the appearance of the rash, provided there be no longer any desquamation, albuminuria or congestion of the fauces.	Fourteen days.
Small-pox . .	Every scab has fallen off . . .	Eighteen days.
Typhus . . .	Convalescence is completed . . .	Fourteen days.
Whooping-cough	The end of the sixth week, if the peculiar paroxysmal cough and the whooping have ceased, or for a shorter period, if <i>all</i> cough have completely ceased.	Twenty-one days at least.
Yellow fever .	Convalescent	Not less than fifteen days.

N.B.—Complete disinfection of person and of clothing must be carried out at the termination of the period of isolation or of quarantine.

should be buried with as little delay as possible.

It is a good rule in practice to regard every disinfectant as being poisonous. Medical men should be careful to avoid carrying infection. Visits to infectious cases should be made not oftener and not of longer duration than is really necessary, and not when exhausted by fasting or fatigue. The hands, &c., should be thoroughly cleansed in a disinfectant and with soap and water when the visit is over, and every possible advantage should be taken of the disinfecting properties of fresh air. It is a good plan on entering the patient's house to put on, over the ordinary clothing, a large mackintosh, kept there for the purpose; this can be sponged over with a disinfectant on leaving the sick-room.

ISOLATION and QUARANTINE are terms often employed indiscriminately and at random, but they can be usefully distinguished. Thus, isolation implies the continued separation of the infectious patient from the healthy until after he has ceased to be infectious; while quarantine (no longer used with its original signification of a forty days' detention) means the segregation of *possibly* infected persons until after the period has elapsed at which they would (if infected) develop characteristic signs of the disease. The duration of this period will necessarily depend upon that of the incubation period of the particular disease to which they have been exposed; it should, indeed, be a day or two longer; and, on its termination, thorough disinfection of the person and of all fomites, such as the clothing, should be carried out before such persons are again permitted to consort with the healthy.

If this disinfection be omitted, the mere quarantine affords practically no safeguard against the transmission and spread of infection, owing to the persistent vitality of the virus, which is especially notable in certain diseases—*e.g.*, scarlet fever. Hence, persons who have recently been in contact with a patient suffering from an infectious disease, or who have been exposed to the same source of infection, should be at once separated from others and kept under observation "in quarantine," for at least a space of time corresponding to the full incubation period of the disease in question; if in good health at the end of this period, they may resume their usual relations to society, after thorough disinfection of their persons and clothing.

The table given on p. 187 indicates the periods of isolation and of quarantine which are generally applicable in the case of the principal infectious diseases.

C. E. SHELLEY.

DISSEMINATED SCLEROSIS (*Multiple Sclerosis; Insular Sclerosis*).—A disease characterized by the formation of patches of sclerosis in many parts of the cerebro-spinal system.

The disease has been described as occurring in three forms—namely, cerebral, spinal and cerebro-spinal, according to the parts most affected; but for all practical purposes it will be sufficient to describe the cerebro-spinal variety, which is the one most commonly met with.

Symptoms.—The onset is gradual. Generally the first symptom to appear is weakness of both legs, the arms being after a time similarly affected. There is no affection of sensation, or of the sphincters. After some months attacks of transient diplopia occur, followed by amblyopia and subsequently by nystagmus. *Amblyopia* remains as a permanent symptom, but it very rarely ends in complete blindness. The optic discs are as a rule unaffected, but in some cases atrophy follows. In a typical case the chief symptoms are the peculiar speech, nystagmus, tremors on voluntary movement, general weakness of the limbs, with some rigidity of the legs and increase of the tendon reflexes.

The *speech* is very characteristic: it is slow, and each syllable is pronounced with difficulty and after a slight pause, giving it what is termed a "scanning" character. In some cases this is so marked that each syllable is blurred out with much effort in an explosive manner, so that the speech becomes unintelligible. Occasionally this condition is associated with tremors of the lips.

The *tremors* occur *only* on voluntary movement. When lying down the patient is quite quiet, but, on being told to touch his nose with the fore-finger, the arm begins to tremble and this increases as the finger approaches the point to be touched, but the movement is *not* increased by closing the eyes. Making the patient raise a tumbler of water to the lips is a common test for this condition. In walking, the leg is brought forward tremulously, sometimes causing the whole body to shake, then the foot which is on the ground trembles whilst the other is brought forward, but there is no throwing about of the legs or stamping with

the heels as in locomotor ataxia. Shaking of the head, when it is raised off the pillow, occurs in some cases, and tremor of the tongue when it is protruded.

Nystagmus of the eyes is a very constant symptom; it is conjugate, and becomes obvious when the patient looks laterally or up or down. The quick oscillating movements of both eyes which constitute this symptom occur in the direction towards which the patient is looking. In extreme cases nystagmus occurs if the patient be merely told to fix his eyes on an object in front of him, but in the early stages of the disease it is not observed when the eyes are at rest.

Besides the above-mentioned symptoms, three-fourths of the patients suffer from *vertigo* (Charcot), which may be either subjective or objective in character.

Mental changes are present in many cases, and sufferers from the disease are very emotional and, in the advanced stage, attacks of dementia are not uncommon. The expression of the face is described as being stolid, vague and uncertain (Charcot), but this is not sufficiently marked in recent cases to be characteristic.

In the limbs, especially the legs, there is progressive weakness, but no paralysis of any particular movement; the legs tend to become rigid.

The *knee jerks* (patellar tendon reflex) are increased, and *ankle clonus* is usually present.

Sensibility is usually not affected at all, and the sphincters not until late in the disease.

As unusual and late symptoms, Charcot mentions atrophy of groups of muscles of the limbs, bulbar paralysis, apoplectic form seizures, associated with acceleration of the pulse and a rapid rise of temperature.

Three stages of the disease are described:—

(1) From the commencement till the patient has to take to his bed.

(2) When he is confined to bed, but the organic functions are intact.

(3) When the organic functions are affected.

In the last stage the sphincters become involved, diarrhoea sets in, followed by general emaciation, the formation of bed-sores, dementia and death.

The *diagnosis* has to be made from paralysis agitans, in which disease the tremors occur while the patient is at rest and diminish on voluntary movement. In general paralysis of the insane the tremors are usually finer and nys-

tagmus is absent, but the diagnosis from general paralysis is sometimes impossible, as the two diseases may be combined. In *tabes dorsalis* the inco-ordination is increased by closing the eyes. Chorea could hardly be mistaken for this disease, as the movements in the former occur irrespective of voluntary movement.

The *prognosis* is very grave; the disease lasts many years, the age of forty appearing to be the limit of life in disseminated sclerosis.

Morbid Anatomy.—The lesions appear as greyish or semi-gelatinous yellow patches, varying in size from a pin's head to that of a pea or they may even be still larger. They are found in the cerebrum, especially the internal parts, in the pons Varolii, cerebellum, medulla and in the spinal cord, where they occur in both the white and the grey matter.

On *microscopic examination*, the patches are found to consist of an overgrowth of the fibrous tissue (neuroglia) of the part. At the periphery of a patch in the white substance the nerve tubules are seen to be separated by the hyperplasia of the neuroglia. In the zone internal to this peripheral part the connective tissue is more abundant and the nerve tubules have lost their medullated sheaths, retaining only the axis cylinders, which are often much enlarged. In the centre very few axis cylinders remain and the nerve tubules are supplanted by thick bundles of connective-tissue fibrils, nucleated cells, fat globules (the remains of the medullated nerve sheaths), and a few granulation corpuscles. The walls of the vessels are much thickened, especially the external coat. In the patches in the grey matter the nerve cells first undergo yellow degeneration, and subsequently atrophy. If a large patch occur in the lateral or posterior columns of the spinal cord, secondary descending or ascending sclerosis, respectively, ensues and is marked by the occurrence of the symptoms characteristic of these degenerations.

Ætiology.—The disease distinctly pertains to youth and early adult life, the most common age being between twenty-five and thirty years. It may begin as early as fifteen and is rare after thirty. In this respect it differs much from paralysis agitans, which is rare before the age of forty. Females are much more often attacked than males, the proportion being 25 to 9 (Charcot). Exposure to wet and cold and excessive mental grief and anxiety seem to be the most potent factors in the ætiology of the

disease, but in many cases no adequate cause can be discovered.

Treatment has hitherto failed to arrest the disease. Strychnine and nitrate of silver have seemed in some cases to diminish the tremors, but for a time only. The strength of the patient should be maintained by good food and the administration of tonics. A trial may be given to the hypophosphites. No marked benefit has resulted from the use of phosphorus, arsenic or belladonna.

C. E. BEEVOR.

DIURETICS are remedies which cause an increased secretion of urine. They effect this by their influence upon the vascular system or by a more direct action upon the kidneys.

The former class comprises those which raise the blood pressure generally throughout the body, such as digitalis, squill, draughts of water, alcohol, scoparium and the application of cold to the surface, and those which produce dilatation of the renal vessels. Squill and digitalis act in this way also; others are spirits of nitrous ether, belladonna, cantharides and aconite.

Substances which have a more direct action upon the kidney cause diuresis either by the effect of an alteration in the composition of the blood on the renal epithelium, or by an influence upon the vessels. Salines act in both of these ways, whilst juniper, copaiba, turpentine, cantharides and all the aromatic and volatile oils and resins act partly on the renal epithelium. In dropsy dependent upon cardiac failure digitalis and squill are most useful, the other diuretics being more efficient in renal dropsy and in ascites from obstruction to the portal circulation. The action of diuretics is often much increased by the previous administration of a purgative and by the combination of several in one prescription.

DROWNING.--In the event of a dead body being found in the water, the following questions may arise:—(1) Was the deceased alive at the time of entering the water? (2) If so, was death due to drowning? (3) If death occurred before submersion, to what was it due?

The most important *signs* of death from drowning are—the condition of the skin known as “cutis anserina” or “goose skin;” froth at the mouth and nose; the presence of excoriations or abrasions of the skin; retraction of the penis; the presence, in the stomach and

lungs, of water similar in character to that in which the body was found; the presence in the hands or under the nails of mud, gravel, sand, or weeds, taken up from the bottom in the death struggle. The other internal appearances may be those of asphyxia (engorgement of the right cavities of the heart, &c.) or of death from syncope.

When a body has remained but a short time in the water the skin will be pale and present the condition of “cutis anserina,” above referred to, produced by contraction of the muscles acting on the hair follicles. If the period of immersion be longer, a few days or so, the skin becomes white, swollen and sodden, and gradually separates.

A person may fall into the water whilst suffering from syncope, epilepsy or concussion, in which case some of the characteristic signs of death from drowning and of asphyxia will be absent.

In the case of a body being thrown into the water after death, in addition to the absence of the signs of death from drowning, some injury or other sufficient cause of death would be disclosed by the post-mortem examination.

It may be stated that, as a rule, it is extremely improbable that a person could survive entire submersion for two minutes.

In attempting to restore animation in a case of apparent death from drowning, the first thing to do is to clear the mouth and nostrils of any mucus or foreign body. The body should then be placed face downwards for about half a minute to permit any water to run freely out of the mouth. Artificial respiration by Silvester's method should then be performed, as follows:—The patient is placed on his back, the person who is to perform the artificial respiration then grasps the arms near the elbows and slowly brings them up over the head, keeping them fully extended for about three seconds. He then brings them down to the side and compresses the thorax laterally at the same time. This is repeated about fourteen times a minute. It is extremely important that none of these movements should be at all hurried, in order that air may be gradually and regularly introduced into the thorax and squeezed out again, after the manner of normal respiration. The body must as soon as possible be wiped dry and covered with dry clothes, and warmth applied to the extremities. Friction may be used to the extremities, and hot sponges applied over the heart at the same time.

When spontaneous breathing has been established satisfactorily, hot drinks should be given and the patient put to bed and kept warm.

JOHN ABERCROMBIE.

DRY MOUTH (Xerostomia).—This condition, of which few examples have as yet been recorded, was first prominently brought before the profession by Mr. Hutchinson at a meeting of the Neurological Society in 1887, when a patient was shown. Next year this case was published in the *Clinical Society's Transactions*, and in the same volume an example which came under the writer's notice is also recorded. There is little doubt that the condition is a definite clinical state, and hence it was suggested by Mr. Hutchinson and the writer independently that the term "Xerostomia" (*ξηρός*, dry; *στόμα*, mouth) would be an appropriate synonym.

Symptoms.—In all the cases the condition of the mouth has been the same. The tongue is red, devoid of epithelium, cracked and absolutely dry; its appearance is like that of raw beef. The inside of the cheeks, the hard and soft palate are also dry, and the mucous membrane smooth, shiny and pale. The salivary glands appear normal, and no obstruction can be detected in their ducts. The general health remains unimpaired, and it is interesting to observe that in no case has digestive disturbance been described. The urine is normal, and the absence of sugar has been expressly noted. From the absence of saliva speech is often difficult and swallowing has to be assisted by constant sipping. In exceptional cases, dryness of the pharynx, diminished secretion from the nose, arrest of the lachrymal secretion, dryness of the skin and falling out of the teeth have been noted. The disease reaches its greatest intensity rapidly, sometimes suddenly, and then remains without change for years. This condition of dry mouth is clearly not dependent on gross change in the salivary glands, but should probably be ascribed to some persistent functional disorder of the nerve apparatus. The fact that the secretion of all the salivary glands, as well as the buccal glands, becomes arrested strongly suggests the existence of a general controlling nervous centre.

All the subjects hitherto have been women, and most of them were between the ages of fifty and sixty-five; in one instance, however, the onset occurred at the age of twenty-three. In three re-

corded instances the disease began suddenly, being preceded in two by severe mental shock.

Treatment.—The writer has found much benefit follow the use of the tincture of jaborandi in doses of 30 or 40 minims three times daily. Pilocarpin also is useful, but less so than jaborandi. Iodide of potassium has been recommended; mercury, quinine, steel and opium have been tried ineffectually. The application of glycerin to the mouth is of decided value in relieving the local discomfort.

W. B. HADDEN.

DUODENUM, ULCER OF THE.

—**Acute duodenal ulcer** is an occasional sequela of extensive burns or scalds of the surface of the body, but the statements of authors vary greatly as to the relative frequency of its occurrence. Probably a large number of cases recover or give rise to no symptoms. If symptoms show themselves during life, they generally do so between the seventh and twenty-first days, and the condition may prove fatal, especially by perforation, up to the sixtieth day. Acute ulcer has also been observed as the result of exposure to extreme cold.

Chronic duodenal ulcer is a more common condition, and one about which little information is usually provided in text-books. It may result from chronic duodenitis, from the presence of ascariides, and possibly from syphilis, while it is occasionally associated with pulmonary tuberculosis. It may occur, like the majority of gastric ulcers, in connection with anæmia in young women, but far more frequently it is found in older persons of the male sex and of alcoholic habits. Its usual seat is the first part of the duodenum, where the acid gastric juice comes in contact with the wall of the viscus, the nutrition of a part of which is presumably defective. Below the opening of the biliary and pancreatic ducts, where the acid is neutralized, ulcer is of extremely rare occurrence. The ulcer may be situated on the anterior or posterior wall, the symptoms varying accordingly. The pathological appearances, and the theories evoked to account for their development, are the same as those of gastric ulcer, to which reference may be made.

The *symptoms* are generally very obscure, often entirely absent, and when present sometimes indistinguishable from those of gastric ulcer. Pain is, however, generally less acute, the food not being submitted to the same churning move-

ment as in the stomach; it follows the ingestion of food at a longer interval, often two or three hours after meals, and, if evoked on pressure, is so more to the right of the middle line. Sometimes an indistinct sense of resistance or thickening may be detected on palpation. The presence of altered blood in the motions in considerable quantities in connection with such symptoms, and without true gastric symptoms, is often suggestive. If situated on the anterior wall, perforation and rapidly fatal peritonitis often ensue. In the majority of cases, however, cicatrization occurs, with contraction; the pylorus is often thus involved, and may even finally be obliterated, the duodenal symptoms being merged in those of dilatation of the stomach (*g.v.*), or the stomach and the part of the duodenum in front of the contraction may be thrown into one, the pylorus being widely dilated. Adhesions may form with the liver, gall-bladder, pancreas or other surrounding organs, into which the erosive process may extend deeply, while fatal hæmorrhage may occur from the pancreatico-duodenal or hepatic arteries, from the portal vein or even from the abdominal aorta. Thrombosis of the portal vein has also been observed. Periduodenal and peri-hepatic abscesses often form, and may rupture either into the peritoneum or through the diaphragm into the pleura. Obliteration of the choledic duct results in persistent jaundice, the distension of the bile ducts throughout the liver, and multiple hepatic abscesses.

The *treatment* must be on the same lines as for gastric ulcer. Possibly a certain number of cases giving rise to obvious gastric dilatation, if seen before the patient is too exhausted, would be favourable subjects for Loreta's operation of digital distension of the pylorus, or for gastro-duodenostomy—an operation which consists in uniting an opening in the stomach to one in the third part of the duodenum. J. J. PRINGLE.

DYSENTERY is an acute specific disease of the large intestine characterized by inflammation and necrosis of the mucous membrane, by tormina and tenesmus, and by the passage of scanty, non-feculent mucous or blood-stained stools.

The disease is endemic in most tropical and sub-tropical countries; sporadic cases are also rarely observed in temperate climates, and hence the specific nature of the disease has been questioned.

First Stage.—The earliest symptoms of

an attack of acute dysentery are loss of appetite, furred tongue, constipation alternating with diarrhœa, malaise, evening pyrexia and chills.

Second Stage.—The pyrexial symptoms grow more marked after three or four days, though the temperature is never much raised (100° F.); colic becomes troublesome, and the lower bowel, unless diarrhœa have been considerable during the premonitory stage, is emptied of its feculent contents. As the disease develops, colic becomes more painful and recurs more frequently; there is constantly recurring desire to go to stool, and the patient suffers severely from burning pain in the rectum.

Third Stage.—The attacks of abdominal pain and the rectal pain and burning become more frequent and severe, and the calls to defecation do not cease; in the intervals between the attacks of colic, localized tenderness, but no tumour, can be made out; the pulse, which has been gradually increasing in frequency, is now very rapid and weak; there is much depression and exhaustion, and the patient not infrequently faints at stool. Thirst is constant and distressing. The urine is small in quantity, loaded with lithates, and passed with pain and difficulty, or there is retention. The straining at stool is only effectual in passing small quantities of blood-stained mucoid or gelatinous material of a non-feculent character, but having a peculiar odour.

Fourth Stage.—All the above symptoms are aggravated, and a rigid contraction of the abdominal muscles is a notable symptom; the stools are now more copious, contain larger masses of blood-stained mucoid material, and have the peculiar offensive sickly smell very pronounced; they sometimes contain pus, or the mucoid material has a peculiar appearance resembling boiled sago.

Fifth Stage.—The symptoms of nervous prostration become greater, the heart's action and the pulse feebler; the features are pinched; the whole body shrunken, and often covered with a cold sweat; the tongue is brown and dry; portions of sloughing tissue may be found in the stools, which are horribly offensive; hæmorrhage is generally present and may be considerable, greatly increasing the general prostration; abdominal tenderness and rigidity of the abdominal muscles are very marked, and a soft doughy tumour may be felt in the course of the colon. The patient sinks into a drowsy, dull state, and dies from asthe-

nia; or the fatal issue may be hastened by perforation of the intestine, and consequent peritonitis.

Sixth Stage.—The sloughing may be very extensive, so that the sloughs become gangrenous, very large areas or almost the whole of the mucous and sub-mucous tissues being detached; the general prostration is intense, but the colic and tenesmus, which had previously been severe, cease: the abdomen becomes tympanitic, but not tender; everything taken by the mouth is rejected, the features are pinched, the tongue brown and cracked; the prostration deepens into collapse like that of cholera, or low delirium ensues, and the patient dies after a few days. The stools at first contain mucus, detritus and blood-stained gelatinous material, but later are watery, black (the so-called "meat washings"), and have a very offensive gangrenous odour.

The symptoms have been for convenience described in six stages, but no case runs through them all; the first two stages are generally to be distinguished, but vary much in duration; the third and fourth may be hurried through, the patient passing into the fifth or sixth in two or three days; the fifth stage may be well established at the beginning of the second week, the sixth at the end of the first week.

The *diagnosis* from ordinary diarrhœa rests chiefly on the gravity of the general symptoms, but especially upon the acute suffering caused by the frequent attacks of colic, and by the extreme rectal burning and straining; in a later stage the character of the stools gives assistance.

Prognosis.—The absence of complications (of the liver especially), a good pulse, moderate tormina and tenesmus, a pallid expression, absence of extreme offensiveness of the stools, and the early reappearance of feculence are favourable signs. The unfavourable symptoms are persistent fever, quick or feeble pulse, dry brown tongue, severe tormina and tenesmus, sudden cessation of severe tormina, increase of putrescence of the stools, the appearance of gangrenous material and the onset of complications. The previous state of health of the patient and the stage of the disease at which he comes under treatment are important points greatly affecting the prognosis favourably or otherwise. Abscess of the liver is frequently observed after dysentery, and enlargement of the liver and of the spleen, malarial fever and scurvy are common complications.

The *pathology* of dysentery has been much discussed. The essential lesion appears to be an acute inflammation of the whole glandular structure of the mucous membrane of the large intestine; the condition in any given case will vary with the stage and intensity of the inflammation. The first changes are those common to catarrhal inflammation in any situation, and there is conspicuous swelling of the solitary glands; the mucous membrane is injected in patches and streaks, the summits of ridges and folds being particularly affected. The surface is covered by mucus streaked with blood. Inflammatory exudation then occurs: the mucous membrane becomes thickened and reddened, and the solitary glands, distended with "gelatinous mucus," stand out white and shot-like, surrounded by a red ring; the sub-mucous tissue is greatly swollen, and the muscular coat also may be involved. The infiltration of the mucous membrane with leucocytes continuing, ulceration occurs; this takes place first over the solitary follicles, small apertures being formed, through which, in time, the gland is discharged as a slough. The larger ulcers formed by surface disintegration of the mucous membrane deepen, their yellow floors being formed of the thickened sub-mucous tissue as a rule, but sometimes by the muscular or even peritoneal coat; in the latter event perforation may readily occur. The ulcers may have any form, and their longest diameter may be in any direction, but it is not uncommon to find them encircle the gut. The exudation may be sufficiently rapid to destroy considerable areas of mucous membrane, which then become detached as sloughs, leaving large, irregular, generally transverse ulcers of a grey or yellow colour. In the most acute form of the disease there is a remarkable thickening of all the coats of the intestine (the "diphtheritic form" of German writers), which feels firm and massive. The whole is not affected to an equal degree, so that folds and grooves are formed, or the thickening may be at first in patches. Where it is well marked, the intestine offers a solid resistance to the knife; its colour varies with that of the intestinal contents, and is generally yellow-grey, green, or black. The *microscopic changes* are extravasation of blood, and copious fibrinous and cellular infiltration into all the tissues. Gangrene eventually occurs; the eschars break down into shreds and scraps, the ulcers left being ragged, and of a dark-olive or brown

colour. The "diphtheritic form" appears to be identical with the gangrenous dysentery of Indian writers. In this form the lower part of the small intestine is liable to be involved, as is also the case in severe catarrhal inflammation going on to ulceration, but even in the most severe cases the morbid changes may be entirely confined to the large intestine. The ileo-colic valve may be destroyed, and the small intestine may then be invaginated into the large, and lead to acute obstruction. Recovery may take place by resolution in the early catarrhal stage before ulceration; afterwards, by granulation and cicatrization, leaving generally much long-persisting thickening.

Ætiology.—Dysentery is related on the one side to malarial fevers, and on the other to diarrhœa. It occurs especially in districts where malarial fevers are common, and disappears as they disappear. The connection is probably twofold—*i.e.*, the conditions which favour the occurrence of malarial fevers in communities also favour dysentery, and the condition of ill-health produced in individuals by malarial poisoning renders those individuals peculiarly prone to dysentery. Contamination of the drinking water with feculent matter, perhaps with matter derived from previous cases of dysentery, appears to be the most frequently operative determining cause; brackish water favours, if it cannot produce, the disease. Its prevalence is favoured by a high air temperature, and is stopped by frost, but a climate presenting great fluctuations of temperature is peculiarly dangerous. This may explain the frequency with which the disease has prevailed to a serious extent in some parts of Germany, in Sweden, Norway and even Iceland. It is not in any special sense a disease of towns, but rather the contrary, and is particularly apt to break out among troops engaged in campaigns; coarse, bad, ill-cooked and therefore irritating food is a factor of only less importance than bad water, and the combination of these two evils explains its importance as a "war pestilence." As a rule, the prevalence of the disease is very limited in extent, and it may be said to co-exist at many foci rather than to prevail over large tracts of country. Rarely, and for the last quarter of a century with increasing rarity, it has spread epidemically, and has thus caused a serious mortality in Germany, France, England and Ireland.

The personal habits or conditions of health which predispose to dysentery are

chronic alcoholism, chronic constipation (probably from the irritating effect of the hardened feces accumulated in the colon), malarial poisoning and new arrival in an endemic district. Surface chill from exposure to cold and damp, especially after exertion, is often the immediate determining cause of an attack. The evidence is against the disease being contagious, but, on the whole, in favour of its being communicable through water or food. It may occur at any age.

SPORADIC DYSENTERY as observed in temperate climates is generally of a comparatively mild type, but does not otherwise differ from the tropical endemic form of the disease.

CHRONIC DYSENTERY often follows an acute attack.

Symptoms.—The appetite is capricious; the tongue clean, red and glazed; there is abdominal tenderness and often masses of thickening may be felt. The patient suffers from painful colic and, if the descending colon and rectum be involved, from tenesmus. The stools are loose, and mucus, blood, or purulent matter is mixed with the feces.

Diagnosis.—Anal fissure and rectal ulcer are liable to be confounded with chronic dysentery, and sometimes exist as complications. In other cases an attack of acute dysentery is followed by cicatricial contraction of the gut, leading to chronic constipation or to obstruction.

Treatment.—If a case of *acute dysentery* can be controlled from an early stage, the results of treatment are, on the whole, more satisfactory than in most other diseases of like severity; this is owing to the almost specific action of ipecacuanha. The patient is put to bed, and from 20 to 30 grains of powdered ipecacuanha, suspended in syrup of orange-peel, are given in a small quantity of water; for the next three hours nothing else must be taken, but, if thirst be distressing, a little ice may be sucked. Nausea is generally experienced in an hour or two, and sometimes the patient vomits after two hours; if vomiting should occur earlier, so that the ipecacuanha is returned, 30 minims of tincture of opium may be given, followed by a fresh dose of ipecacuanha in half an hour. It is, however, undesirable to repeat the opium, and the ipecacuanha may preferably be given with bismuth, carbonate of sodium, camphor, chloroform or hyoscyamus. The second dose is given eight, ten or twelve hours after the first, and is rather smaller. When the first dose is given, a poultice or turpentine stupe should be applied to

the abdomen, or a sinapism over the epigastrium. The dose for an infant of six months is 1 grain; of one year, 2 grains; and 1 grain more for each additional year of age. Pregnancy is not a contra-indication; severe dysentery, if unchecked, usually causes a pregnant woman to abort, and death almost invariably ensues. The ipecacuanha is repeated night and morning until the tormina and tenesmus cease and the stools begin to be feculent.

During this period the diet should consist only of chicken, mutton or veal broth, meat jellies, and arrowroot or sago, with, as a stimulant, port wine or brandy. When dysentery is complicated by malaria, or is suspected to be so, 10 to 20 grains of quinine should be given at the commencement of the treatment, and subsequently doses of 10 grains in the intervals between the ipecacuanha. The malarial complication is said to be frequently responsible for vomiting when it occurs after ipecacuanha. In mild cases, a hot bath, followed by rest in bed, a few doses of ipecacuanha (gr. xv to xx); and subsequently, a draught containing castor oil (3j to 3ij) and opium may suffice.

In *chronic dysentery*, the first indication is change of air—in tropical cases, to the temperate zone. Woollen clothing must be worn, especially over the abdomen; the diet must be very bland and unirritating—often a milk diet for some time will be best. In bad cases, irrigation of the bowels with large quantities of a solution of nitrate of silver (3j to Oj) or alum may be efficacious. Even in the acute stage ice-water injections, with or without an astringent, have been advocated; about 3 or 4 pints will be required, and the injection must be suspended when pain comes on, and be resumed when it passes off.

DAWSON WILLIAMS.

DYSMENORRHŒA.—Some writers, adhering to etymology, understand by this term pain produced by the uterine contractions which expel the menstrual decidua; others extend it to any kind of pain which recurs once a month, and appears to depend on menstruation or ovulation. The latter use is adopted in this article.

1. Obstructive Dysmenorrhœa.—It has been maintained that not only in the majority, but in all cases dysmenorrhœa is due to mechanical obstruction, and that, owing to narrowing of the canal, the uterus has to contract more vigorously in order to force the blood past an obstacle, the pain being due

to these violent contractions. There is no doubt that obstructive dysmenorrhœa exists, as, after amputation of the cervix, gradually increasing menstrual pain may occur from progressive contraction of the orifice, which may ultimately produce complete atresia and retention of the menses. It may result from contraction of the cervical canal following the use of caustics, or from blocking of the canal by fibroids polypi or cancer. Obstructive dysmenorrhœa of this kind is rare, and does not date from the beginning of menstruation. But it is also supposed that obstructive dysmenorrhœa is common as a primary condition, dating from the establishment of menstruation, and that it is then due to stricture at either the internal or the external os (the advocates of this theory are not agreed as to where the stricture most commonly is), or to flexion of the uterus, the canal being flattened at the point of flexion. The writer has never seen a museum specimen, nor is he aware of any accurately measured case, of stricture (*i.e.*, organic narrowing) of the internal os. A very narrow external os, so that it will only admit a No. 1 or 2 bougie, or not even that, is occasionally seen, and in most cases is not accompanied by any dysmenorrhœa. Blocking of the uterine canal by flexion and dilatation of the uterine cavity behind the obstruction is sometimes seen in old women, in whom the uterine wall is thinned by atrophy; and also when the uterus is fixed in the bent position by adhesions, and therefore cannot contract properly; but it has never been found in a uterus which was free to contract, and had a wall of natural thickness. It is therefore very doubtful whether there is such a condition as primary obstructive dysmenorrhœa; and it is quite certain that if it exist it is extremely rare. The pain in genuine obstructive dysmenorrhœa does not reach a high degree of severity.

The *diagnosis* can only be made by physical examination. When an attempt is made to pass a sound, the canal is found to be blocked, and the sound cannot be passed. If a fine probe be forced past the obstruction, it is gripped, and its withdrawal is followed by escape of retained fluid.

The *treatment* is to open up a passage, either by dilating or by cutting, or by removing that which is blocking the canal, according to the nature of the case; and, when this is done, relief at once follows.

2. Spasmodic Dysmenorrhœa.—This

is a nervous disease; it is therefore sometimes described under the name of "neuralgic" dysmenorrhœa, but this term is better reserved for a different class of case.

The pain is due to spasmodic uterine contractions, the cause of which is not known. It is frequently coincident with deficient uterine development, and this seems to point out the direction in which preventive treatment should tend. Pain of this kind generally dates from the beginning of menstruation, but it may come on later, even after the patient has had many children, and in some such cases is due to fibroids. After it has been cured by dilatation, relapse may occur. When the disease has lasted long, ovarian pain is often added to the uterine pain, which gradually becomes longer in duration, until the patient is never free from pain. Should the patient marry early and become pregnant, the dysmenorrhœa will probably be cured. But frequently it is associated with lack of sexual desire and enjoyment, and even repugnance to and pain in sexual intercourse, and with sterility. In that case, if the dysmenorrhœa be cured, pregnancy may follow. This affection has been called by some "obstructive" dysmenorrhœa, and ascribed to stricture or flexion of the canal. But there is no stricture, the proof of this being that at the height of the pain a No. 7 or 8 bougie may be passed without being gripped, and when withdrawn no blood follows. It has been compared to labour, and ascribed to disturbed polarity; so that, instead of there being good contraction of the body and relaxation of the cervix, there is contraction of the cervix and imperfect painful contraction of the body. This view is plausible, but as yet no evidence has been brought forward to support it. This form of the disease occurs quite as often in uteri that are straight as in those that are bent. It has been ascribed to malformation of the cervix, the vaginal portion being conical and the os externum circular. These conditions are often met with in this disease, but in many cases they are absent, and the os externum is generally so large that if the hole were in a blood-vessel the patient would bleed to death in a few minutes.

The *diagnosis* rests mainly upon the following points:—(1) The exceeding severity of the pain. (2) The pain, although severe, is usually of short duration. (3) The pain is generally paroxysmal, depending on clonic contraction of the uterus, each paroxysm lasting a few

minutes. But the contraction is sometimes tonic, and the pain continuous. (4) It is not localized in one spot, but referred to the back and lower abdomen generally. (5) It is not relieved by lying down. Lastly, the proof of the diagnosis is that the pain is cured by dilatation of the cervix. The pain, as a rule, either begins with the flow or precedes it by a short interval. It may occur in the menstrual interval, and not during the flow, but this is very rare.

The *prognosis* is more favourable than in any other form of dysmenorrhœa except the obstructive. Cure is least likely in cases in which the disease occurs along with an imperfectly developed uterus.

Treatment.—Dilatation of the cervical canal is usually the best treatment. There are various ways of effecting this, but it is best performed with metal bougies. No. 6 can usually be easily passed, and then successive sizes can be introduced one after the other until a size is reached which is gripped by the canal. Each bougie should be left in until the pain caused by its introduction has subsided, which will usually be in two or three minutes. If the pain should not subside within ten minutes, the bougie should be withdrawn, and further dilatation desisted from. The patient should afterwards keep her bed for the rest of the day. Some think that relief is attained with greater certainty by incision, but no facts have been published in support of this opinion. Those who practise incision of the external os for the relief of this condition generally combine with it some kind of dilatation of the os internum. But if there be distinct deformity of the vaginal portion, with narrowness of the os externum, it will be well to combine division of this part with dilatation of the os internum. If the dysmenorrhœa be associated with ovarian pain, it is well to keep the patient in bed until the next period is over. In the experience of the writer, about one-fourth of the cases of primary dysmenorrhœa can be cured by dilatation alone. The best medicinal treatment consists in the administration of anti-pyrin, of which three doses of 15 grains each may be given, and of diaphoretics, such as liq. ammon. acet. ℥j, or amm. chlorid. ℥j, or mist. guaiaci ℥j. Hot applications to the hypogastrium and hot gin-and-water are popular domestic remedies. Opiates should on no account be given, nor should alcohol be recommended. If the disease be so severe as to interfere with the patient getting her living or

fulfilling her social duties, and other treatment fail, it can be cured by removing the ovaries, which is preferable to teaching the patient to resort to opium or alcohol.

3. **Membranous dysmenorrhœa** is due to the menstrual decidua, instead of undergoing disintegration, being shed in one or more large pieces, which obstruct the cervical canal, and so cause painful menstruation. This form is literally obstructive, but the obstruction is in the flow, and not in the uterus. The membranes shed usually show appearances of slight inflammation, and hence this disease is commonly regarded as a form of endometritis. Some cases are really instances of monthly abortions, their nature being shown by there being neither passage of membranes nor pain while the patient is leading a single life. The disease occurs at all periods of menstrual life in the virgin, the married, and the parous.

The *diagnosis* is made by finding the membranes. The affection is probably much commoner than is generally supposed, because, in the majority of cases, the patients are unaware that they pass membranes until they are asked to examine the discharge. Pieces of membrane can be distinguished from clots by their being, when unfolded (for they are usually passed rolled up), smooth on one side (the inner) and dotted with the openings of the utricular glands, whilst on the other (the outer) they are rough. In case of doubt, a microscopic examination should be made.

Practically nothing is known as to its *etiology*.

The *treatment* of membranous dysmenorrhœa is unsatisfactory, and there is no treatment from which success can be predicted. Arsenic has been given, and perchloride of mercury sometimes succeeds. Intra-uterine applications generally fail to do good. The best treatment consists in the use of tonics to improve the general health and increase the resistance of the nervous system to painful impressions. In the virgin local treatment should not be practised. In the married the cervical canal may be dilated; this may relieve the pain, although it cannot be relied upon to cure the affection.

4. **Ovarian dysmenorrhœa** is the form in which the pain is not in the uterus, but in the ovaries. This kind of pain may be due to ovulation, or to the general congestion of the pelvic organs which precedes menstruation. Nothing is known about the changes in the ovary that give

rise to the pain. The characters of the pain are—(1) it is localized, usually at a spot about 2 inches internal to the anterior superior iliac spine; (2) it is neither severe nor paroxysmal, but gradual in onset and subsidence, may last some days, and is usually described as “aching” or “burning”; remissions and exacerbations may occur; (3) it is relieved, but not altogether removed, by recumbency and is aggravated by exertion, alcohol and constipation.

The *diagnosis* is made by the characters of the pain, combined with tenderness in the situation of the ovary, either on pressure abdominally, per vaginam, or per rectum.

The *prognosis* depends chiefly on the duration of the disease. If of only a few months' date, it can generally be cured; if it have lasted for years, the prospect is unfavourable.

Etiology.—Its most common cause is child-bearing and lactation, together with depressed conditions of health, such as anæmia and nervous exhaustion. Among other causes are gonorrhœa, the excessive use of alcohol, and morbid sexual excitement. Sometimes it remains after the acute exanthemata. It may be secondary to some disease of the uterus, such as spasmodic dysmenorrhœa, retroflexion, or inflammation of cervix.

The *treatment* consists in the cure of any disease of the uterus that may be present, and the improvement of the general health by the removal of anæmia, if present, by iron, and by the promotion of appetite and sleep; rest in the recumbent position; laxatives; the avoidance of alcohol; counter-irritation to the iliac regions either by flying blisters or lin. iodi. Opiates should be avoided. If hypnotics be needed, the bromides are the best.

5. **Intermediate dysmenorrhœa** is a term which can only be defended as clinically useful to denote a class of cases in which there is pain, lasting a few days, which recurs regularly once a month, but not at the menstrual period. The characters of the pain usually warrant the belief that it is ovarian, and its monthly recurrence, that it is caused by the process of ovulation. There is evidence that the maturation and bursting of Graafian follicles may take place at any time between two menstrual periods; and, therefore, if this process be painful, the pain may have any relation in point of time to the menstrual flow. The treatment of such cases is that of ovarian dysmenorrhœa.

6. **Congestive Dysmenorrhœa**.—This

term has been applied to more than one class of case.

(a) *Primary, or initial, congestive dysmenorrhœa.*—This comprises cases of menstrual pelvic pain which do not fall under any of the preceding categories. The pain is not of great severity, not localized in either ovary, not paroxysmal, and is usually relieved by lying down. No membranes are found, and no abnormal condition is discovered on examination. In such cases, if the flow be scanty and the patient plethoric, leeches may be applied to the groins or perineum, saline laxatives given, and the recumbent position maintained. If the flow be profuse, the latter measures only are indicated.

(b) *Acquired Congestive Dysmenorrhœa.*—This is a well-marked form, but not common in the virgin. A patient, who has previously menstruated without pain, after a chill or some disturbance of health or perhaps without any obvious cause, finds menstruation getting more scanty and attended with increased pain. In such cases it is a reasonable hypothesis that the pain occurs because there is not enough blood lost to relieve the menstrual congestion.

The success of *treatment* bears out this view of the pathology. Recent cases—that is, of not more than six months' duration—can almost always be cured by local depletion. Four or six leeches should be applied to the cervix (or to the groins or perineum in a virgin). In the interval the patient should insert a glycerin pessary (gelatin gr. xx, glycerin ad ℥ij) night and morning, having first used a warm vaginal douche. Laxatives should be given. In a quite recent case, relief will probably be complete. In cases of longer duration, the first depletion may only benefit for a short time, but after each subsequent abstraction of blood the freedom from pain will last longer. It is only in cases of very long standing that, when combined with rest, this treatment fails to afford relief.

(c) *Secondary congestive dysmenorrhœa* includes those cases in which the pain is due to the aggravation of some morbid condition by the menstrual congestion. In uterine displacements, pelvic peritonitis, diseases of the Fallopian tubes, vaginitis, hæmorrhoids, movable kidney and many other conditions, all the symptoms are usually worse at the menstrual period. Investigation will detect its cause. The *treatment* is that proper for the disease underlying the complaint.

6. *Neuralgic, or Neurotic, Dysmenorrhœa.*—There is a class of patients

in whom the nervous system is comparatively unstable, who are easily upset by trifling causes, are very sensitive to pain, and liable to neuralgias of all kinds. In them the vascular and other disturbances accompanying menstruation may evoke manifestations of nervous disturbance in remote parts, with or without pelvic pain. There may be headache, facial neuralgia, nuchal pain, epigastric pain with or without vomiting, intestinal colic followed or not by diarrhœa, ocular symptoms, temporary mental derangement or emotional excitement. This form of dysmenorrhœa is identified, first, by the irregular character of the morbid sensations, which are diffused, not confined to the pelvis, and do not follow a regular type; and secondly, by the kind of patient in whom it occurs—*i.e.*, in weakly, nervous, anæmic, often badly developed subjects.

The only *treatment* that can do any good is of a kind beneficial to the nervous system—tonics, iron, change of air and scene, regular hours and good food. Removal of the ovaries in such cases may sometimes stop menstruation, but does not remove the pain.

G. E. HERMAN.

DYSPEPSIA, ACUTE.—Acute dyspepsia is generally traceable to errors in diet; it occurs at all ages; it is more frequent in dark-complexioned than in fair persons, and is especially frequent in the gouty.

The *symptoms* are headache, frontal, occipital, or general, anorexia, nausea, and vomiting. The tongue is coated or plastered, and the breath foul. Food cannot be retained. Occasionally there are chills, rigors, epigastric pain and slight icterus. The vomited matters usually contain more or less bile. The bowels are generally confined.

The *prognosis* is favourable; the affection usually subsides under appropriate treatment in a few days.

Treatment.—The administration of food must not be attempted till vomiting ceases. Then a breakfast-cupful of beef-tea, alternately with the same quantity of milk, thin gruel or arrowroot, should be given every three or four hours. A little toast may be allowed, but no other solid food; soda-water is permissible. The diet is to be extended cautiously as the symptoms subside and the tongue clears. Alcoholic liquors are to be avoided. Pil. hydrarg. in doses of 3 to 5 grains, or 2 to 4 grains of calomel, should be taken at once, and mist. sennæ co.

3j-ij three hours later. If vomiting be troublesome, ac. hydrocyan. dil. ℥ij, with sod. bicarb. gr. xx, should be given in 3j of plain water every six hours.

ISAMBARD OWEN.

DYSPEPSIA, CHRONIC.—This is a term applied indifferently to all forms of chronic disturbance of the gastric functions which are not traceable to organic or reflex causes or to direct irritation.

These disorders of digestion are variously referred to chronic catarrh of the mucous layer, to enfeebled action of the muscular coat, to exaltation of sensation, to perversion of secretion, to the presence of abnormal ferments, to deficient action of the liver causing portal congestion or to several of these causes combined.

The catarrhal forms are usually distinguished as "irritative" dyspepsia; those thought to be due to enfeebled action of the muscular coat or secreting glands, as "atonic" dyspepsia.

The *symptoms* most commonly recognized as due to these forms of gastric disturbance are sensations in the epigastrium, varying from slight uneasiness and a sense of "sinking" to "weight" or "fulness" or to actual pain, which often extends to the interscapular region. These sensations usually commence from a few minutes to a few hours after taking food, and pass away as the stomach empties itself, but sometimes they are constant throughout the day, and in a certain proportion of cases most acute when the stomach is empty, food bringing relief. The appetite is usually diminished, the tongue swollen or reddened, and covered with a slight white fur. The patient is generally languid and depressed, his temper is irritable, and he is troubled with eructations. It is less usual to find the pain localized in the mid-sternal, cardiac, hepatic, splenic or umbilical region. Flushing of the face after meals, oppression of breathing, palpitation of the heart and headache, usually occipital, are symptoms sometimes complained of. Nausea, retching and vomiting are not infrequent. A somewhat rarer manifestation of the disorder is a craving for food at a time when the stomach is full, which is known as *bulimia*. In a few cases the patients describe shooting pains in the shoulders, neck or arms; and still more rarely numbness of one or more digits, apparently caused by a reflex vaso-motor spasm. The bowels in all cases are liable to be confined; diarrhoea rarely occurs. The epigastrium is usually found to be more or less tender on pres-

sure, the tenderness being fairly equally diffused.

The "irritative" forms of dyspepsia are especially indicated by acuteness of the pain, redness and furring of the tongue, marked loss of appetite, nausea and liability to vomiting. The purely "atonic" forms, on the other hand, are recognized by the dulness of the pain, the flabbiness and pallor of the tongue, the presence of appetite and the absence of nausea. The distinction between these forms of dyspepsia is, however, very indefinite in practice, and probably a purely "atonic" condition of the gastric wall is rarely met with. The products of disordered digestion can hardly fail to excite local irritation in some degree.

The *prognosis* is generally favourable, but dyspepsia is often obstinate and may last during life. In persons predisposed to tubercle it should be looked upon with suspicion, as it is sometimes premonitory of phthisis.

Pathology.—The pathology of these disturbances is mainly conjectural, and they have no recognized morbid anatomy. Torulæ and sarcinæ are sometimes found in the stomach during their continuance.

Ætiology.—Chronic dyspepsia is undoubtedly due in some cases to anæmia, to debility from various causes, lithiasis, diabetes, chronic renal disease, chronic heart disease (causing passive congestion), hysteria, habitual constipation and habitual cough. It may be traced in some cases to loss of teeth, to a sedentary life, errors in diet, the abuse of alcoholic liquors, condiments, tea or tobacco, but it frequently occurs without any discoverable cause.

Treatment.—The first point to be attended to is a strict observance of proper intervals between meals, and to forbid the taking of food or drink between the regular times. The rate of digestion in the subjects of dyspepsia is usually slow, and an interval of five hours will generally be required after a moderate, and one of six or seven after a full, meal. The patient must be warned not to mistake the "sinking" or craving of an irritated stomach for a demand for food. It is also necessary to restrict the amount of food taken as nearly as possible to physiological requirements, so as to throw no more work than is necessary on the disturbed organ. Unless much irritation of the stomach be present, the tendency of the dyspeptic is nearly always to exceed the requirements of the system.

A specific prohibition of sticky, heavy or greasy articles of food, and in "irri-

tative" cases of highly seasoned dishes and condiments, is necessary, as such are much affected by many dyspeptics. Pastry, cheese, pork, salt meats, crabs and lobsters, uncooked vegetables and fruits are especially apt to disagree, and should be categorically forbidden. In many cases potatoes are found to be inadmissible. Butter may generally be allowed in moderation. Constant regard must, however, be had to *idiosyncrasy* in matters of diet, which is often singular and unaccountable.

Alcoholic liquors should generally be forbidden in "irritative" cases. Light wine or beer is sometimes beneficial in "atonic" cases, and, in the aged, small quantities of spirits are at times found to stimulate a failing digestion. The stronger wines are seldom of service. *Alcoholic liquors should never be ordered for women in dyspepsia without urgent cause. The practice of taking them to relieve epigastric "sinking" is one of the most prolific sources of female drunkenness.*

It is as well to prohibit the use of strong tea, which dyspeptic women in particular are very apt to drink to excess. Coffee and weak tea are matters of individual idiosyncrasy, and their admissibility can only be decided by experiment. Cocoa is well tolerated by many dyspeptics. If the bowels be costive, they should be regulated, not by the occasional administration of strong purgatives, but by the use of habitual mild laxatives, to which small amounts of mercury, podophyllin or euonymium may be added, if the tongue show a tendency to display a loose coating. *Cascara sagrada*, in doses carefully regulated so as to avoid griping and irritation, is a valuable laxative in "atonic" cases. Daily injections of a drachm of glycerium will sometimes procure a regular alvine action.

It must be carefully ascertained whether the teeth are in working order and whether mastication is properly performed. In elderly people a set of artificial teeth may be the only treatment required. Anæmia, debility, lithiasis, diabetes, disease of the heart or kidneys, or hysteria, if present, must be combated by the treatment appropriate to those conditions; and, if sedentary pursuits appear to have induced the dyspepsia, regular, but not excessive, exercise should be ordered.

In "irritative" cases relief is often afforded by the salts of bismuth. They may be administered three times a day, just *after* a meal, bism. subnit. et mag. carb. levis āā gr. x, suspended by a

drachm of mucilage in aq. menth. pip. ʒj. If there be much pain, liq. morph. bimec. ℥ij-v, or tr. belladonnæ ℥vj, or tr. hyoscyami ʒss, may be added with advantage; and ac. hydrocyan. dil. ℥ij should be introduced if nausea or vomiting be present. The morphine should not be continued for more than a fortnight if it can be avoided.

In "atonic" cases the best results are obtained from a combination of an acid with a vegetable bitter: *e.g.*, 10 to 15 minims of a dilute mineral acid, flavoured with 1 drachm of syrup of orange peel, in infusion of quassia, calumba, or gentian, taken three times a day *au hem* after a meal. Liq. strych. hydrochlor, ℥ij, or tr. nuc. vom. ℥x, may be added to, or substituted for, the bitter infusion, and stimulating aromatics, such as clove, nutmeg or ginger, are at times of service. In some cases it will be found that an alkali (liq. potass. ℥x, or sod. bicarb. ʒj) alone, or in combination with a bitter, affords more relief than the acid. There is no trustworthy indication as to the cases in which acids or alkalies respectively are preferable.

In "irritative" cases flatulence is often troublesome. It is best combated by the use of anti-ferments. One grain of carbolic acid, or 1 minim of creasote, or $\frac{1}{2}$ grain of thymol may be given in pill twice a day, or ac. sulphurosi ʒj in 3 ounces of water once or twice daily. In "atonic" cases aromatics and bitters are the best preventives of flatulence.

Pepsin, to the extent of 5 grains in pill or powder, or a teaspoonful of one of the advertised liquid preparations of pepsin given after meals, is sometimes found to aid digestion in "atonic" cases. Extract of malt (a table-spoonful twice a day after meals) is also of service in certain cases. Small doses of arsenic are not infrequently of benefit in "atonic" cases, especially when general nervous debility is present, and the dyspepsia appears to be but a symptom of the general state. In severe cases a much more restricted diet may be required for a time, the case being treated practically as one of mild gastritis.

ISAMBARD OWEN.

DYSPHONIA (Hoarseness) is brought about by much the same set of conditions as give rise to aphonia (*q.v.*), but they are of a less pronounced character. Hence, hoarseness frequently precedes or follows aphonia. The most frequent causes of hoarseness are conditions which produce irregular vibration in the

vocal cords, as, for example, inflammatory conditions of the cords, adherent mucus, new growths or ulceration, and paralysis of one cord.

DYSPPŒA signifies a difficulty of breathing, from whatever cause it may arise. It may be due to laryngeal or

tracheal obstruction, to lung disease, such as emphysema, phthisis or pneumonia, to pleurisy or some affection of the heart, or may result from anæmia. If the dysppœa be so urgent that the patient can only breathe when supported in the upright position, it is termed "orthoppœa."

E

ECCHYMOSIS is the name given to an effusion of blood into the subcutaneous tissues, whether as the result of violence or from disease. When large, there will be considerable swelling, and the part soon becomes purple, the colour gradually changing to a brown and ultimately passing through green and yellow before the skin regains its natural appearance. Very small extravasations of blood do not cause any swelling; they may be known by their purple colour, and by the fact that they do not fade on pressure. They may be of any shape or size: when small and round, they are called *petechiæ*; when occurring in lines, *ribices*.

ECTHYMA is a term used to designate a pustular eruption the lesions of which consist of large, isolated, flat, flaccid pustules on an inflamed, hard base, followed by thick, dark crusts, leaving deep pigmentation and sometimes superficial scarring.

The affection occurs only in badly fed and cachectic individuals, especially in children and old persons, and is now recognized as being almost invariably an epi-phenomenon in cases of scabies, pediculosis, impetigo, eczema, dermatosyphilis or any other pustulating dermatoses. Very exceptionally, cases answering to the above description appear to occur independently and justify the retention of the name. Any soothing local application is effectual in bringing about cure, but constitutional treatment alone is of service for preventing fresh outbreaks.

J. J. PRINGLE.

ECZEMA (Moist Tetter) may be defined as an acute or chronic, non-infective, catarrhal inflammation of the skin.

It is characterized, in its most advanced stages, by the successive development of erythema, papules and vesicles or pustules, with serous or purulent discharge, accompanied by itching or burning, and

dependent mainly on constitutional causes.

It is the commonest and most important disease of the skin and frequently complicates other skin affections, as the result of scratching or irritating applications. Pathologically and clinically it is a typical inflammation of the skin, and names, still useful for descriptive purposes, have been attached to its various phases, which were previously regarded as separate forms of disease. The term *eczema erythematousum* denotes its mildest form, in which the skin is reddened, slightly swollen, infiltrated and tense from active congestion; the colour of the patches is more vivid, and their edge less well defined, than in true erythema. Soon, increase of hyperæmia with infiltration of the papillæ and rete Malpighii with serum and migrated leucocytes, results in the formation of minute intensely itching papules of a deep-red colour and firm consistence, arranged in irregularly shaped groups (*E. papulosum*). At this stage the process may be arrested. The condition now somewhat resembles a lichen, and, indeed, was formerly described as lichen simplex; the arrangement of the papules is, however, different, and careful examination with a lens seldom fails to discover incipient vesication at some part of the eruption.

Usually, the process advances; serous exudation accumulates between the comparatively loosely connected cells of the rete mucosum, and raises the cuticle to form vesicles containing clear fluid, constituting the most constant and characteristic phase of the disease, *E. vesiculosum*. With increased duration and intensity of the inflammatory action, the fluid in the vesicles becomes cloudy from increased diapedesis of leucocytes, or frankly pustular (*E. pustulosum*), the pustules being usually of larger size than the preceding vesicles. Frequently, however, pustulation does not ensue, but the cuticular covering of the vesicles yields

under the pressure of the rapidly exuded serum, and the rete mucosum, covered with exudation, is exposed. Large, raw, "weeping" surfaces, studded with red points, are formed by the coalescence of these excoriations, and to this common and typical condition, which may also succeed *E. pustulosum*, the term *E. madidans* or *E. rubrum* is applied.

The fluid discharged from such surfaces has the familiar property of stiffening linen, and, if it does not escape, macerates the surrounding skin, causing extension of the disease *per contiguitatem*, and dries up to form crusts and scabs, the colour of which varies according to the amount of the contained cell elements. If these are small in number, the crusts are thin and pale-yellowish in colour (*E. crustosum*); if numerous, and especially if bleeding occur from the exposed capillaries, the crusts are thick and dark in colour (*E. impetiginosum*). The latter form occurs with special frequency in strumous children on the scalp and face, and the crusts may acquire a peculiarly offensive odour from the decomposition of sebum poured out in excessive quantity as the result of inflammatory implication of the sebaceous glands.

The return to health is first evidenced by diminution in the amount of exudation and progressive extension of epidermic cells from the edge over the surface of the excoriated patch. Even when this process is complete, the skin remains thickened, indurated and reddened, and excessive cell formation continues on the surface of the patch, resulting in the formation of whitish, more or less adherent scales of shed epithelium (*E. squamosum*), a condition which may prove very persistent.

If situated upon parts subjected to much movement (*e.g.*, the hands, articulations), deep, painful cracks or fissures are liable to form in the hardened skin in a direction similar to that of its normal folds, and transverse to the direction of the principal movements of the part (*E. rimosum* or *E. fissum*). Where a tendency to passive congestion exists, as in the lower extremities, recovery is naturally slower than where the circulation is active, the papillæ of the skin may permanently hypertrophy, and cause general or limited warty outgrowths (*E. hypertrophicum*, *E. verrucosum*). There is also a special tendency to chronicity around hair follicles, where irritable, acuminate papules may persist for prolonged periods (*E. folliculare*). True eczema probably

never causes scarring, and the pigmentation left by it soon disappears.

The pathological histology of the disease may be inferred from the foregoing sketch.

In the *diagnosis* of eczema, *locality* is an important factor; it is common wherever skin and mucous membrane join, wherever hair and sebaceous or sweat glands abound, and where the skin is soft, thin, or thrown into folds, *e.g.*, the flexures. The value of itching, especially in the vesicular and papular forms, or of burning as diagnostic points has already been mentioned. Polymorphism, due to the simultaneous existence of various phases of the disease, is as marked a characteristic of eczema as of syphiloderma, and the same necessity arises for complete examination of every patient. Difficulties in diagnosis chiefly arise from the arrest of the morbid process in the earliest, or its persistence in the latest stages; in the former case evidences of vesication, in the latter of serous discharge, will seldom be wanting; even the scales of the most obstinate *E. squamosum* show dried gummy material on their deep surface.

It is of practical importance to differentiate true eczema from local dermatitis the result of topical irritation, although such a distinction is arbitrary and convenient rather than scientifically accurate. The salient points of contrast to eczema presented by a dermatitis are—it is local, and confined to the region directly affected by the irritant, the intensity is directly proportional to that of the irritant, and the further progress is at once arrested by removal of the irritant. A connecting link between dermatitis and eczema—thus conceived—has recently been recognized in the fact that a very large number of eczemas are secondary to the decomposition of sebum or sweat, secreted in excessive quantity and undergoing putrefactive changes—probably under the influence of specific micro-organisms, hitherto undetermined—as the result of which they become chemical irritants to the skin (*E. seborrhæicum*, *sweat eczema*). The point has an important bearing on treatment.

Differential Diagnosis.—Acute eczema is liable to be mistaken for erysipelas, local dermatitis, or miliaria rubra; papular eczema for lichen or multiform erythema; vesicular eczema for herpes or bullous erythema; pustular eczema for scabies, impetigo, pustular syphiloderma, folliculitis, or tinea favosa; and squamous eczema for psoriasis, pityriasis rubra,

lupus erythematosus, seborrhœa, and tinca tonsurans.

Prognosis.—Eczema is seldom dangerous to life. Children are frequently reduced to a very low state by it, but rarely die. Occasionally, in old persons suffering from chronic Bright's disease, the condition becomes universal, and death results. Acute eczema tends either to relapse at regular intervals after apparent recovery, or to become chronic with occasional acute exacerbations. The not infrequently observed alternation of eczematous attacks with bronchial catarrh or asthma and with gastric catarrh is the basis of the popular belief, still shared by some medical men, that the rapid cure of a skin disease may result in more dangerous affections of the internal organs from metastasis. The most experienced dermatologists have pronounced such fears chimerical.

The *etiology* of eczema is a problem of the greatest difficulty and complexity, which is far from having received complete elucidation.

Young children and old persons are specially liable to eczema, as they are to catarrhal affections of the bronchial and other mucous membranes. Men appear to be more frequently affected than women, probably because they are more exposed to the various causes of local dermatitis in the course of their occupations. An hereditary tendency to the disease certainly exists in the form of an inherent susceptibility to irritation by mechanical, thermic or chemical agents, not noxious to healthy skins; thus the sun's rays, cold winds, soaps, or vaccination may cause eczema in one child only out of a number subjected to absolutely identical influences, no demonstrable morphological peculiarity of the skin being present. To invoke an "herpetic" or "dartrous" diathesis as explanatory of such facts is only to throw the argument one step further back.

The association of eczema in children with scrofula, dentition, improper feeding or worms, in adults with rheumatism, gout and "the gouty condition" (including lithiasis, oxaluria, renal inadequacy, senile glycosuria), with dyspepsia, chronic constipation, uterine disorders and alcoholism, is so frequent as to suggest strongly a causal connection. This view is also strengthened by the markedly beneficial influence on the disease of remedial measures applied to those various concomitant conditions, but the essential nature of the connection is unknown, and it is probable that there is

a mutual dependence on a common cause, rather than interdependence. There is no more fertile obvious source of eczema than depressed conditions of the nervous system, such as result from worry, anxiety, overwork, neurasthenia and anæmia (especially when attending over-lactation); this fact, the severity of the itching, and the marked symmetry of the lesions all give colour to the theory now gaining ground, that changes in the central nervous system, the nature of which is beyond our present knowledge, probably underlie all cases of true constitutional eczema. Treatment recently advocated in the form of counter-irritation over the spine, based on this theory, appears to be attended with decided success.

General Treatment.—Predisposed persons do well to adopt certain general preventive measures. Rough woollen clothing, exposure to cold winds, sea air or excessive heat, or to various noxious substances used in many trades, copious sweating, dirt, the frequent intermittent application of water, especially of salt water, and the use of irritating soaps or cosmetics are to be avoided. Proper dietary restrictions ought to be observed.

Acute eczema in the earlier stages is best treated by complete rest, liquid diet, saline aperients and diuretics, and locally by protective dusting powders (oxide or oleate of zinc, bismuth, prepared chalk, cimolite, salicylated starch); a few drops of antimonial wine are often useful in robust persons. When the discharge is profuse, and burning or itching severe, cold lead lotions (*e.g.*, liquor plumbi subacetatis dilutus, B.P.), applied on soft linen rags and frequently renewed, are valuable. An excellent lotion, which combines the qualities of a cooling application and of a slightly greasy dressing, is made by adding a drachm of liquor plumbi subacetatis to an ounce of fresh milk. Poultices and water dressings covered with oiled silk are specially injurious.

The treatment of chronic eczema is far more important and more difficult, and the value of personal experience in its management is paramount; nor will any severe or old-standing case recover without persistence in the line of treatment adopted. The diet ought generally to be of a simple and unstimulating description; salt meats, pastry, cheese, coffee, peppery condiments, strong wines and malt liquors ought scrupulously to be avoided; in anæmic women and old men a glass of sound wine with meals is, however, often to be recommended. Milk

vegetables, white fish, stewed fruits and farinaceous foods are generally suitable, as are alkaline table waters. Frequent washing with soap and water is deleterious, especially if the water be "hard," as it produces maceration of the delicate cuticle. Water boiled with bran, barley or oatmeal, and strained, is less noxious, and rice-milk or thin gruel are excellent cleansing and soothing substitutes for water. When soap becomes permissible, that manufactured in Hamburg with a super-fatty basis is to be strongly recommended. Sulphurous baths (Strathpeffer, Harrogate, Bagnères, Aix-les-Bains) are sometimes of advantage in very chronic cases with dryness and thickening of the skin without much irritation.

The concomitant dyspeptic or other troubles must be treated according to their predominant symptoms. It will suffice here to state that attention to the regular action of the bowels appears to be of special importance, and that cod-liver oil is as valuable for the eczema of children as the various preparations of iron are for anæmic patients.

Opium frequently aggravates the itching, and its use is to be avoided for the treatment of that symptom in favour of chloral or the bromides in children, henbane or the tincture of hop in old persons. A dose of sulphate of quinine at bedtime is often effectual in producing a good night's rest.

The utility of arsenic is strictly limited; it is distinctly deleterious in the acute stages, when the disease is extensive or itching severe. Its effects are frequently strikingly beneficial in old-standing cases with much infiltration and dry scaling, and in young children, provided the digestive functions be in good order. The dose should be small at first, then cautiously increased. The liquor arsenicalis is the best preparation, and must always be largely diluted and given on a full stomach. Pitch pills or turpentine internally are sometimes useful in very chronic cases if the general health be unimpaired.

The removal of decomposing and irritating matters from the surface of the skin by vigorous washing is a necessary preliminary to the successful treatment of all eczemas which depend upon the presence of such a condition. All cases resulting from seborrhœa and hyperidrosis—and they are numerous—must be treated thus, and the procedure repeated as often as the re-accumulation of sebum or sweat necessitates. The subsequent

local treatment is the same as for other forms of eczema, and may be said to have for its objects—(1) the diminution of hyperæmia and exudation, (2) the relief of itching and burning, (3) the stimulation of indolent chronic patches.

These objects are attained by the use of lotions, ointments and pastes; broadly speaking, lotions are most suitable for moist, ointments and pastes for dry surfaces. Lotions are also generally preferable for exposed parts, for children, and in warm weather; their method of application has been already described. Solutions of the salts of lead and of borax (3j ad 3iij), are those most generally useful for the more acutely hyperæmic and profusely discharging forms. Dilute solutions of carbolic acid (gr. v-xv ad 3j), liquor carbonis detergens (3j-5j ad 3viii), thymol or naphthol (gr. v-xx ad 3j with a little spirit) often relieve itching. The lead and milk lotion already mentioned is useful for more chronic, slightly discharging surfaces, as are thick lotions containing protective soothing substances in suspension with mucilage or tragacanth, *e.g.*, the oxide (gr. x-xxx ad 3j) and carbonate of zinc (gr. xxx-xl ad 3j), subnitrate of bismuth (gr. v-xv ad 3j), and chalk; applied with a camel's-hair brush, and allowed to dry on the part. Glycerine is apt to irritate, but may be used as a vehicle when slight stimulation is indicated, when lotions containing sulphur are also useful, especially for limited scaly patches. A valuable formula is—R Sulphur. precip. gr. xx, ætheris ℥xxx, spir. lavandulæ ℥xx, glycerin. ℥xv, aq. rosæ ad 3j. In the same circumstances Hutchinson's lotion (liq. carbonis detergens 3ijss, liq. plumbi subacetat. 3ss; 3j in a pint of warm water, to be applied with a sponge) is often of great service.

Ointments are the most generally useful applications; although often disagreeable, they soften and protect the skin, cool it by facilitating evaporation, and act with comparative rapidity, while their effects are durable. Failure to obtain a cure by them is often the result of an imperfect mode of employment rather than of faulty selection of the remedy. Crusts must first be removed by the application of cold starch poultices, soaking with olive oil or a solution of bicarbonate of soda (gr. xxx-5j ad 3j), then the exposed surface is dried with absorbent wool. The ointment must be smeared over the part, and pretty thickly and evenly spread over properly cut strips of soft linen, and applied like a loose band-

age, the edges overlapping. The "many-tailed" form of bandage is handy for the extremities. The whole should then be covered and fixed in position with a flannel roller. For the face, a flannel mask may be necessary, especially for children. Usually, one change of dressing daily suffices, but two changes in the twenty-four hours may be expedient if crust formation is rapid. The oxide and carbonate of zinc and lead, the subnitrate of bismuth, or the pure oleates of these metals, obtained by double decomposition, are the most generally useful remedies, made up with benzoated lard, vaselin, or lanolin, and the addition of salicylic acid (2 per cent.) is often advantageous.

The following formulæ may all be recommended:—(a) Ung. zinci oxidi, B.P. (b) Ung. zinci oleati, B.P. (c) R Zinci carbonatis gr. xxx- $\tilde{a}\tilde{a}$, adipis benzoati $\tilde{3}\tilde{j}$. (d) R Emplastri plumbi $\tilde{3}\tilde{x}$, olei olivæ $\tilde{O}\tilde{j}$; heat and mix thoroughly, then add olei lavandulæ $\tilde{3}\tilde{i}\tilde{j}$; this was much used by Hebra. (e) Bismuthi subnitratis vel oleatis gr. x-xxx, adipis benzoati et vaselini $\tilde{a}\tilde{a}$ $\tilde{3}\tilde{s}\tilde{s}$. (f) Ung. zinci oxidi, vaselini albi $\tilde{a}\tilde{a}$ $\tilde{3}\tilde{i}\tilde{i}\tilde{j}$, acidi salicylici 2-4 per cent.; this forms a specially useful ointment, to which starch may be added up to 50 per cent., according to the consistence desired. (g) R Boracis gr. xx, adipis benzoati $\tilde{3}\tilde{j}$. On obstinate, pustular forms and old chronic patches mercurial ointments appear to have an "alterative" as well as a stimulant action, and those of the subchloride, perchloride, ammonio-chloride, nitrate and red or yellow oxides, found in the B.P., are all valuable preparations, which ought, however, generally to be diluted or combined with others. Vigorous washing with an alcoholic solution of soft soap (saponis mollis, alcohol rectif. $\tilde{a}\tilde{a}$ $\tilde{3}\tilde{v}\tilde{j}$) before the application of the ointment is a useful and painless stimulant measure in many of these cases. The various forms of "salve-muslin" recently introduced by Unna, of Hamburg, and manufactured by Beiersdorf, of that city, are convenient for the continuous application of ointments. The zinc-ichthyol salve-muslin is specially useful in chronic, scaly eczema.

Pastes resemble ointments in their mode of application, but are only useful to scaly patches; they dry up, forming an adherent coating to the skin. A useful basis consists of equal parts of lanolin, vaselin, oxide of zinc and starch, with which tars, naphthol, resorcin, ichthyol or salicylic acid, in proper proportions can be conveniently combined. A gene-

rally useful application in sub-acute and chronic eczema is Unna's glycerin jelly, which is thus constituted:—Glycerin 30 parts, gelatin 15, oxide of zinc 10, water 40. When these are melted together a gelatinous mass is formed, which is liquefied when the vessel containing it is immersed in boiling water, and is applied to the skin with a stiff brush, a layer of cotton-wool being superimposed to form an impermeable but pliant coating, which is easily removed with warm water. It is advisable to diminish serous oozing by cold starch poultices containing 2 to 3 per cent. of boracic acid before applying the glycerin jelly.

The effect of tars upon old scaly patches is often beneficial, but so capricious that it is a wise rule to begin by applying them to a very limited region in order to test their effects. The liquor carbonis detergens may be conveniently incorporated with one of the foregoing ointments in the proportion of $\tilde{3}\tilde{j}$ to $\tilde{3}\tilde{i}\tilde{i}\tilde{j}$, and increased slowly if tolerated.

Finally, the most obstinate cases may be treated by caustic applications (*e.g.*, tincture of iodine, saturated solutions of caustic potash or nitrate of silver) applied with caution, or by blisters, the thickened epidermis being removed afterwards by rubbing with bran, and the exposed raw skin dressed with soothing applications.

Patches of eczema ought never to be washed with ordinary soap and water, which has a destructive effect upon the young cuticle of healing patches. Oil, white of egg, oatmeal and tepid water are the most appropriate substances for necessary cleansing, and it is advisable for eczematous persons to use only super-fatty soaps.

The local varieties of eczema are so important that they may be advantageously briefly discussed, and the favourite remedies enumerated.

E. Capitis.—(1) In children: Usually diffuse, pustular, impetiginous, not itchy; pediculi often present as a primary or secondary condition; often of seborrhæic origin; does not cause baldness nor broken hairs. *Treatment:* Removal of crusts by oil, and sometimes subsequent poultice; diluted white precipitate or red oxide ointments (also destroy pediculi), olive oil and lime-water, equal parts, with carbolic acid gr. v ad $\tilde{3}\tilde{j}$; zinc ointment and lanolin, with salicylic acid gr. viiij ad $\tilde{3}\tilde{j}$. Systematic washing, followed by borax ointment gr. xx ad $\tilde{3}\tilde{j}$.

(2) In adults: Usually chronic, dry, squamous, with much itching. *Treatment:* Mild tarry ointments, *e.g.*, oil of

cade 5ss or more, with almond oil 3j, equal parts of soft soap, alcohol, and tar; carbolic lotions, diluted red oxide ointment, ichthyol, with lanolin and vaselin 5 to 20 per cent. (Hutchinson's lotion).

E. Faciei.—(1) Acute: Common, resembles erysipelas, but temperature never much raised, swelling of eyelids, and lax parts marked, but not brawny, nor attended with same feeling of tension; general symptoms much less severe. *Treatment*: Dusting powders and general, as already sketched.

(2) Chronic: (a) In children, associated with pustular *E. capitis*; same treatment suitable.

(β) In adults, often erythematous, with much itching. Oleate of zinc 5j ad 3j and weak carbolic lotions specially useful; about eyebrows and angles of nose often seborrhœic. Treat as above.

E. Labiorum.—Often obstinate; causes painful fissures; must be differentiated from herpes and syphiloderma. *Treatment*: Emollients, glycerine or painting with nitrate of silver or solution of caustic potash.

E. Palpebrarum (Tinea Tarsi).—Common in scrofulous children, and obstinate. *Treatment*: Yellow oxide of mercury ointment (gr. iv ad 3j); dilute citrine ointment, epilation, painting edge of everted lid with solution of caustic potash (gr. x ad 3j), and immediately afterwards with dilute acetic acid.

E. Barbae.—Resembles and may be complicated with sycosis, i.e., folliculitis, but is more superficial; unaccompanied by deep papules and tubercles; spreads to or exists upon other parts; must be carefully differentiated from tinea barbae. *Treatment* must be vigorous and persistent; remove crusts, cut beard close or shave carefully every two or three days, epilate loose hairs; if acute, litharge plaster with olive oil, or ointments of zinc and bismuth; if chronic, white precipitate or ichthyol ointments: specially avoid poulticing.

E. Aurium.—Common, troublesome, often pustular, with crusting. *Treatment*: Remove crusts; syringe often required; mild mercurial ointments, mild tars or carbolic lotion, painting with nitrate of silver or caustic potash solution.

E. Genitulum.—(1) Acute: Common in men, the penis becomes immensely swollen and œdematous, the scrotum excoriated and weeping. *Treatment* as for other acute eczemas.

(2) Chronic: Common in both sexes; itching most distressing, and scratching

causes aggravation of condition; diabetes often present. *Treatment*: Prolonged hip bath, followed by dusting powders or borax lotions; carbolic acid, thymol, or naphthol lotions or ointments, mild mercurials or tars, painting with iodine or nitrate of silver after application of a handkerchief dipped in very warm water; mustard leaf over lumbar spine.

E. Ani.—Very troublesome; simulated by condylomata, especially in children; associated with chronic diarrhœa, worms, varix and fissure. *Treatment*: Careful cleansing of parts with warm water after each motion, regulation of bowels; vermicides; calomel ointment with vaselin; red oxide of mercury ointment; zinc ointment with liquor carbonis detergens; cocaine (5 per cent.) with lanolin, or in suppository; oleates of lead, zinc or bismuth; thymol; painting with iodine or eucatic potash.

E. Intertrigo.—Commonest in groins, inner surfaces of nates, below mammae of obese women as result of contact of surfaces, uncleanness, or sweating. *Treatment*: Lint between surfaces, dusting powders; astrigent lotions, e.g., of sulphate of zinc, borax, acetate of lead; rest.

E. Mammar.—Commonest in nursing primiparae; at first vesicular, then squamous, with painful fissures and much crusting; is very obstinate. A similar condition, known as "Paget's disease," is accompanied by deep infiltration, and is cancerous in nature. *Treatment*: Nipple-guard; remove child altogether, or nurse only on healthy breast; begin with ointments of boracic acid, salicylic acid, or oleates; vigorous washing with spiritus saponis alkalinus; diachylon ointment, or painting with caustics; if completely rebellious, removal with knife.

E. Umbilici.—Resembles syphilitic disease of same part; is tractable. *Treatment*: Zinc ointment.

E. Crurum.—In old people as result of varicosity of veins, and not associated with eczema elsewhere; skin much infiltrated, red, scaly, with indolent ulcers. *Treatment*: Rest, limb elevated, methodical bandaging; if weeping, wash with soft soap and alcohol; diachylon, zinc, bismuth or mild mercurial ointments; lotions of perchloride of mercury, lead and milk, or calamine paint. Martin's bandage useful in some cases of ulcer, applied only during the day, and carefully washed at night. Its action, if beneficial, is obviously so in a few days; if not, had better be discontinued. Iodoform is useful as a local anæsthetic; when pain

is intolerable at night a compound soap pill often valuable.

E. Manuum.—(1) Acute: Common; implicates whole of both hands, with much oedema of dorsum, or is most marked along edges of fingers where deep-seated vesicles abound; very liable to relapse at regular intervals; possibly identical with cheiropompholyx. *Treatment* as for acute eczema elsewhere.

(2) Chronic: Common about palms and knuckles; dry, with fissures; must be diagnosed from psoriasis and syphiloderma. *Treatment*: Stimulant; tars, mercurials, removal of epidermis by Unna's salicylic acid plaster renewed every two or three days, or by soaking in solution of liquor potassæ on rags for days, then dressing with soothing ointments; no washing; india-rubber gloves.

E. Unguium accompanies chronic *E. manuum*. Nails are rough, dull, brittle, and punctate. *Treatment*: Mercurials to roots; arsenic internally.

E. Plantarum.—Resembles *E. palmarum*. J. J. PRINGLE.

ELECTRICITY is used in medical practice for its physical properties, in the investigation of disease, and as a therapeutical agent.

For the purpose of investigating the electrical excitability of nerves and muscles, two batteries are required—viz., a continuous current battery of about twenty to thirty cells, and a faradic or interrupted current battery. The continuous current battery ought to be provided with some arrangement, such as a *dial collector*, by which additional cells may be gradually added to the circuit, and a *commutator*, or mechanical arrangement for reversing the direction of the current. A *galvanometer* is also necessary in order to gauge the strength of the current. It may either be attached to the battery, or independent of it but included in the circuit. It is only by its use that any certainty can be arrived at that the same current strength has been used to produce similar reactions in muscles the condition of which has to be compared. This cannot be decided by the number of cells it is found necessary to employ to produce contractions in corresponding muscles of opposite limbs, because the resistance may be different, as is often the case in a diseased and a healthy limb. No practical means has yet been devised for measuring the interrupted current. We must therefore compare contractions produced by its agency with those pro-

duced in a corresponding muscle in a healthy subject. The operator should always graduate the interrupted current by the strength which will produce contraction of one of his own muscles. The most useful muscles for this purpose are those composing the ball of the thumb. Experience gained from the frequent habit of making electrical examinations will teach an operator what corresponding current ought to produce a contraction in any particular muscle that has to be tested. The strength of current given by each faradic battery also varies, so that when using an unknown battery it is the more essential that an operator should first test its effects on his own muscles.

Every faradic battery should be provided with a *rheostat*—an arrangement for regulating the current either by introducing into, or removing from, the circuit more resistance; or by exposing more or less of the coil of wire to the influence of induction. The best forms of faradic batteries now in use are those in which the inducing current is obtained from one or two galvanic cells. For testing the contractile property of muscle, the primary coil is the better, as the secondary produces a current of higher tension (or, possessing a greater electromotive force), and is therefore more painful; but the secondary current is to be preferred for testing electro-sensibility.

For the use of both batteries, continuous and interrupted, it is necessary to have *rheophores*, or conducting cords from the battery to the patient. At the ends of the rheophores, for the purpose of applying the current to the patient, it is necessary to have instruments of various sizes and shapes called *electrodes*. The limbs to be examined and compared should be placed in the same position. When it is wished to ascertain the condition of the muscles, the skin over them should be moistened with salt and water. Duchenne found that muscles could be more easily excited at certain points, which he called *points d'élection*. These points were afterwards proved to be the positions where the motor nerves entered the muscles, or for deep muscles where the supplying nerve approached nearest the skin, and could therefore be more easily excited. These positions are now called "the motor points," and are depicted in most works on nervous diseases.

For the continuous current a pad should be placed on an indifferent part of the body, and the electrode applied to

the muscle, the condition of which it is required to ascertain, should be made alternately negative and positive by means of a commutator, and the contractions produced compared. Then the contractions produced on the affected limb should be compared with those produced on the healthy side; or, if both limbs be affected, a current registering 2 milliamperes on a galvanometer ought to produce a contraction.

The average resistance offered by the human body, under these circumstances, may be taken to be about 1000 ohms; the resistance of individuals varies considerably, chiefly due to the condition of the skin. More cells will be required with one individual to register 2 milliamperes on a galvanometer than with another. For all practical purposes the resistance of corresponding limbs in the same individual may be taken as equal, although this is not always the case. If a very accurate examination and report be required, it is first necessary to discover the relative resistances of the two limbs. This can be ascertained by the help of a galvanometer. If twelve cells of a battery applied to a limb make a galvanometer register 2 milliamperes, and the same number of cells from the same battery applied to the corresponding limb do not register so much, there is a difference of resistance, the latter limb offering an increased resistance.

In examining for faradic contractility, it is best to remove the pad from the indifferent part of the body, and attach another smaller-surfaced electrode with a handle to the rheophore. If the pad be retained on an indifferent part of the body, an interrupted current is so diffused, and so many muscles are thrown into a state of contraction, that no reliable diagnostic information can be obtained. Therefore it is best to apply one electrode to the trunk of a nerve, and the other to the individual muscles supplied by the branches of that nerve.

When it is desired only to influence the skin in testing the electro-sensibility of a part, one moist electrode should be placed on an indifferent part of the body, and the other, a dry one, such as a metallic brush, applied tightly to the part to be tested, the skin also being allowed to remain dry.

The chief use of electricity in diagnosis is to help in distinguishing cerebral from spinal or peripheral lesions. The current from a constant current battery always flows from the positive to the negative pole, and is called a descending current.

When the polarity of the electrodes is reversed for the purposes of diagnosis, it is assumed that the current flows in the reverse direction, and it is then called an ascending current. The positive pole is called the *anode*, and the negative the *cathode*. In the reactions of healthy muscle to the continuous current a stronger contraction is produced on closing a descending current than on closing an ascending current; or, in other words, a stronger contraction is produced in a muscle when the electrode applied to it is negative than when it is positive—i.e., a cathodal closure contraction is stronger than an anodal closure contraction. This is expressed by the formula $C.C.C. > A.C.C.$

The reverse of this reaction occurs in the "reaction of degeneration," and, as far as electrical diagnosis is concerned, it is the chief point that can be elicited by the use of the continuous current. Erb's definition of the "reaction of degeneration" is:—"A diminution and loss of faradic excitability in both nerves and muscles, whilst the galvanic excitability of the latter remains unimpaired, is sometimes notably increased, and always undergoes definite qualitative modifications."* In some affections the galvanic irritability of nerves and muscles is increased, but the reactions may be qualitatively normal.

The normal polar reactions of nerves occur in the following order:—

- C.C.C. . Cathodal closure contraction.
- A.O.C. . Anodal opening contraction.
- A.C.C. . Anodal closure contraction.
- C.O.C. . Cathodal opening contraction.

In the human subject, where it is impossible to operate on the exposed nerve, the A.C.C. and A.O.C. are about the same in force. The chief practical fact worthy to be noted is that *in health* the C.C.C. exceeds the A.C.C., and the A.O.C. the C.O.C.† In the early stages of some paralyses the galvanic irritability is very often increased. By paralysing the ends of the nerves with curare, the muscle can be made to contract independently of nerve excitation, but the purely muscular contraction is more wavy and prolonged than when the innervation is intact. The interrupted current is of greater use in electro-diagnosis. When interruptions take place more frequently than ten times in a second, a tonic contraction

* "Electro-therapeutics," by Wilhelm Erb, M.D., translated by A. de Wetteville, M.D. (1887.)

† Hughes Bennett.

of healthy muscle is produced, provided a current of sufficient strength be used. When the motor cells at the origin of the nerves, or the nerves themselves anywhere in the course of their distribution, are impaired or destroyed, then the faradic contractility of the muscles they supply is either modified or lost.

Greater use has lately been made of electricity as a therapeutical agent. The known physiological effects of electricity do not explain its beneficial action in many of the diseases in which it is employed. We do not understand what changes take place in a nerve to produce the appreciation of pain, or those which are antecedent to the atrophy of a muscle; nor are we cognizant of the exact molecular change in a nerve which ultimately leads to muscular spasm. We do not understand the mechanism by which a nerve impulse is transmitted along the strands of nerve fibre in the desired direction, or why in certain states of disease we are unable to transmit it, and, in fact, often cannot prevent it taking a course contrary to our will. It is therefore not surprising that we are at present totally at a loss to explain the therapeutical action of electricity.

The knowledge of *catelectrotonus* and *anelectrotonus* naturally leads to the use of the negative pole in the treatment of diseased conditions, which are thought to be due to a decreased nervous excitability, and to that of the positive pole for its calming effect when increased nerve excitation is believed to be present, as in many forms of neuralgia, and often with the most satisfactory results. But *catelectrotonus* and *anelectrotonus*, as far as is known, are only transitory physiological effects of the current, whereas their application to abnormal nervous conditions is often followed by permanent results in the shape of improvement or cure, from which it is inferred that some permanent molecular change had taken place in the nerve.

Other properties are possessed by electricity which may explain many of the phenomena observed to follow its use in the treatment of disease, such as its physical action in the encouragement or retardation of *osmosis*, according to the direction of the current; its chemical properties, on which are dependent what has been called its *catalytic* or *cataphoric* effects, and also electrolysis; and its stimulant, refreshing, and mechanical effects. The latter is a property chiefly exerted by the interrupted current.

Static Electricity.—In early days this variety was the only form used, because it was the only form known. For many years after the discoveries of Galvani and Faraday, static electricity still remained in exclusive possession of the field of electro-therapeutics. The number of accessories required, the expense and cumbersomeness of the machines, and the unpleasant shocks employed in some forms of its administration have prevented the frequent employment of frictional electricity in the treatment of disease, but its use has of late years been revived, especially by Charcot at the Salpêtrière, and no doubt it is the most valuable form of electricity for the treatment of some affections, especially those of an hysterical nature.

Static electricity is administered in several ways. First, by *insulation*, or what may be called a dry electric bath. This is carried out by placing the patient on an insulated couch or chair, and charging him from a frictional electric machine; equilibrium is allowed slowly to re-establish itself through the atmosphere. This treatment is said to produce perspiration, and encourage and increase all the usual secretions of the body. A second method is to take *sparks* from a patient who has been previously charged, or by presenting the part of the patient it is wished to influence to a condenser already charged. A third method is by *shocks*. This is only suited for local application, and consists of discharging a Leyden jar through the part of the patient to be treated—*e.g.*, through the pelvis for amenorrhœa.

Galvanism.—The batteries used for diagnostic purposes may also be employed for the treatment of many affections which can be relieved by galvanism or faradism. In the use of galvanism two methods are followed—one, the “*stable*,” in which both electrodes are kept perfectly stationary, the current passing evenly between the two points; the other, the “*mobile*,” in which one electrode, usually the negative, is moved over the limb or part it is wished to influence. In both cases the skin should be previously moistened with salt water. The best form of electrodes are carbon or metal discs covered with chamois leather. In either method of administering galvanism it is often convenient to have one electrode placed on an indifferent part of the body. The best electrode for this purpose is an oval plate of some pliable metal, such as tin, covered

with a layer of amadou to retain moisture, the whole being enclosed in a loose cover of washleather or flannel, having a waterproof back to protect the patient's clothes. When galvanizing the arms this plate electrode can be slipped beneath the collar to the back of the neck; when the legs are treated it can be applied to the lower part of the dorsal spine and the patient allowed to lie upon it. The greatest chemical and thermal action takes place about the negative electrode, and for this reason it is usually chosen as the movable one.

What is called "central galvanization" consists in applying the negative electrode in succession to the chief nervous centres—viz., to the brain, spinal cord, and sympathetic in the neck—the other electrode being placed on the epigastrium or some other remote part of the body. This method of electrization is generally employed when it is sought to influence the whole nervous system, as in states of great nervous depression, or exhaustion after long illnesses, or in cases of nervous insomnia. Other special affections—such as neuralgias—which are treated by galvanism are often better relieved by applying the positive pole to the painful area. On the other hand, sciatica is more successfully treated by the negative pole, the current used being as strong as the patient can bear.

Faradism.—Faradism does not produce the physiological changes which are so characteristic of the constant current, and is, generally speaking, of less use as a therapeutic agent. It is of greatest service in certain forms of paralysis, as it helps to exercise the muscles, and thus to maintain and promote their nutrition whilst repair may be taking place at the seat of the disease. In some forms of neuralgia, also, it is found more effectual than galvanism. It probably relieves pain by the production of nerve vibrations. When used for the treatment of general conditions of the system, it is either employed in the electric bath, or by what is termed "general faradization," one electrode being placed on an indifferent part of the body, or the feet are placed on a metallic plate, whilst the whole surface of the body is sponged with the other electrode.

Electricity is often of service in those affections which come equally under the care of the physician and the surgeon, such as incontinence of urine, cystitis, and neuralgia after injuries.

W. E. STEVENSON.

ELEPHANTIASIS ARABUM (Barbadoes Leg; Tropical Big Leg) is a chronic hypertrophic disease of the skin and subcutaneous connective tissue, accompanied by cedematous swelling and induration, by pigmentation and papillary outgrowths.

The lower extremities and genitalia are the commonest seats of the disease, but the hands and arms not infrequently suffer also; at first the condition is usually one-sided. Recurrent attacks of erysipelatous inflammation, followed by more or less permanent enlargement of the affected member, first attract attention. During these the adjacent lymphatic glands are enlarged, and the lymphatic vessels show themselves as red lines or knotty cords. At first the skin pits on pressure; afterwards it becomes dense, indurated, and warty from the outgrowth of hypertrophied papillae; dirt accumulates in the folds, dilated surface lymphatics rupture and discharge, maceration and irritation of the mass ensue, causing crusts, fissures, and ulcers. Pain is not usually severe, but the usefulness of the limb becomes impaired from its weight and size. Scrotal and labial elephantiasis may reach huge proportions, and the genital apertures become buried and inaccessible.

Although generally a tropical disease, endemic in the West Indies, South America, West Africa, Egypt, India, and China, sporadic cases occasionally occur in temperate zones. The condition is essentially due to blocking of the lymphatic channels. Tropical elephantiasis is associated with chyluria (*q.v.*) and the presence in the blood and lymphatics of a nematode worm, the *filaria sanguinis hominis* (*q.v.*). In temperate climates recurrent erysipelas or eczema, persistent phlegmasia dolens, or anything causing permanent lymphatic blocking may produce the disease.

Treatment.—In the early inflammatory stages the limb should be kept at perfect rest, cooling lotions used, and general antiphlogistic measures adopted. When permanent enlargement is established, firm bandaging with an elastic bandage from below upwards ought to be maintained, the limb being elevated. Massage in the direction of the lymph stream would probably be of service. Galvanism and the compression or ligation of the main artery to the affected part have been recommended. Finally, free removal of the parts with the knife may be necessary.

J. J. PRINGLE.

EMBOLISM is the blocking of a vessel, usually an artery, by a substance or particle of matter circulating in the blood. Emboli have many sources of origin, which are here named in their relative order of frequency.

(1) Thrombi from the cavities of the heart, either *en bloc* or in fragments. Occasionally a shower of embolic particles are discharged into the circulation owing to a clot having undergone central softening and rupture.

(2) Thrombi (or portions of them) detached from the veins, especially those of the lower extremities and the iliac veins.

(3) Fragments of vegetations from the valves, aneurysmal clots, and atheromatous detritus.

(4) Malignant growths which have perforated the vessels.

(5) Parasites.

(6) Fat molecules, pigment granules, and micro-organisms.

In most cases arterial branches are the seat of impaction. Capillaries may sometimes be blocked, and occasionally the portal vein or its branches.

When an embolus is impacted in an artery, thrombosis occurs above and below, as far as the first large collateral vessel. If the embolus be impacted at the bifurcation of a vessel, the blocking may be incomplete. The clinical differences between the blocking of an artery by thrombosis and by embolism are that the onset of symptoms in the latter is sudden, whereas in the former it is usually slow. Moreover, owing to the sudden obstruction of the circulation in embolism, the immediate and remote results are more severe, because degenerative changes in the tissues commence before the collateral circulation is established.

The organs in which the results of embolism are especially marked are those having arteries with a terminal distribution. When an embolus is impacted in an artery of the lungs, spleen, kidneys, or brain, a wedge-shaped portion of tissue corresponding to its distribution is deprived of blood, and, as the obstructed vessel has no anastomosis, there is no possibility of a collateral circulation being established. The portion of tissue thus deprived of blood loses its functions and undergoes degenerative changes. There is an afflux of blood to the vessels in the immediate neighbourhood, causing a well-marked zone of hyperæmia. Unless the embolus obstruct a large artery, it

is not of much importance if the affected organ have only a single function, but in the brain, where every portion of the cortex is differentiated to some particular function, blocking of a vessel may cause irreparable loss of power.

The term *infarct*, although implying an infiltration of a part, is used indifferently whether the wedge-shaped area become filled with blood or remain permanently anæmic. In the latter event it is called a *primary white infarct*. This is seen especially in embolism of the vessels of the brain and of the arteria centralis retinae. The changes which occur in the tissues deprived of blood are first coagulative necrosis and subsequently fatty degeneration.

Secondary white infarcts arise from the red infarcts by absorption of the pigment.

Red infarcts, often termed *hæmorrhagic*, have an appearance on section like damson cheese; the wedge-shaped area of tissue is so swollen by exudation of blood from the vessels that its base projects from the organ as a rounded prominence. There are two views as to the mode of production of this form of infarct. Cohnheim explains it thus:—After embolism, in the lungs, spleen, or kidneys, the branches of the artery beyond the seat of impaction contract and empty the capillaries and arterioles; the pressure in these vessels then becomes lower than that in the veins, and blood regurgitates; but meanwhile the capillary walls have become altered, and the blood escapes from them into the tissues. As embolism is a frequent complication of those forms of heart disease in which there is a back pressure on the veins (*e.g.*, mitral stenosis), this explanation was generally accepted until Litten showed that the true explanation of the occurrence of *red infarcts* on the surface of certain organs having terminal arteries is that these organs are invested with a capsule, which has a distinct source of blood-supply. When an area is deprived of blood by embolism, he states that his experiments lead him to conclude that these small vessels slowly, by small anastomoses, pour blood into the vessels of the anæmic area, which blood escapes (under arterial pressure) from the vessel into the tissue, until the swelling prevents further entrance.

Changes which occur in Infarcts.—The red infarcts undergo decolorization, from changes in the pigment, becoming first brown, then yellow, finally white; if the

infarct be small, it becomes completely converted into fibrous tissue, leaving a scar. If it be a large infarct, the central portions often undergo softening. They may eventually dry up, and leave a depressed scar, an appearance frequently seen on the surface of the kidney.

Infective emboli occur in pyæmia and ulcerative endocarditis. The particles which form the embolus consist of or contain micrococci; these may lead to a suppurative inflammation of the area of infarction, followed by the formation of metastatic abscesses, especially in the former disease.

Capillary embolism occurs in pyæmia, from the obstruction of capillaries by micrococci; in malaria, by pigment granules; and fat embolism of the pulmonary capillaries has been met with in cases of osteo-myelitis, fracture, contusion, and diabetic coma.

Some of the principal clinical results of embolism may be summarized as follows:—Hemiplegia, aphasia, and hemipopia, from blocking of the middle cerebral artery or its branches; and blindness, from embolism of the arteria centralis retinae.

Occasionally a large clot detached from the right heart, or more frequently from the iliac or femoral veins, blocks the pulmonary artery to such an extent as to give rise to sudden death from asphyxia. Embolism of branches of the pulmonary artery is not uncommon in heart disease, and is followed by *pulmonary apoplexy*.

The coronary arteries or their branches may be the seat of embolism, and sudden death may occur from paralysis of the heart, or it may terminate in degenerative changes of a portion of the myocardium. Embolism of the spleen is not attended with any evident symptoms beyond pain, tenderness, and some swelling of the organ. When branches of the renal artery are blocked by emboli, blood may appear in considerable quantities in the urine.

Embolism of the main artery of a limb, except in old people with degenerated vessels and a feeble circulation, is rarely followed by gangrene, but in young people it frequently gives rise to aneurysm.

F. W. MOTT.

EMETICS are substances which produce vomiting. They do this either by their effect on the stomach, or by acting on the vomiting centre in the medulla oblongata. Emetics are termed local or general according to their mode of action.

To the former class belong large draughts of tepid water, alone or in combination with mustard (3ss) or salt (3j), sulphate of zinc (gr. xxx) or sulphate of copper (gr. v-x), or carbonate of ammonium (gr. xxx).

To the latter group belong apomorphine, ipecacuanha (gr. xxx of the powder or 3j of the vinum ipecac.), and tartar emetic (gr. iij) or 5j of the vinum antimonialis. Apomorphine may be used hypodermically (gr. $\frac{1}{8}$); the others are administered by the mouth. Emesis may also be induced by irritation of the fauces with a feather.

Emetics are employed when it is desirable to empty the stomach of its contents, as in some cases of poisoning and of indigestion, or to promote the expulsion of mucus from the air passages, as in bronchitis or broncho-pneumonia—an effect produced by the mechanical compression of the lungs which occurs in the act of vomiting.

EMMENAGOGUES are agents having the power of producing menstruation.

In the strict sense of the word, there is no such thing as an emmenagogue. The only way in which treatment can produce menstruation is by removing conditions which prevent it. Thus iron, by removing anemia; cod-liver oil, quinine, and other tonics, fresh air, exercise, sea air, and sea-bathing, by improving nutrition, may re-establish suspended menstruation. When, in consequence of cold or shock, menstruation has been arrested, we may promote dilatation of the vessels of the pelvic region, and so favour free circulation through this vascular area, and consequent renewal of healthy function, by warm hip-baths and hot poultices to the lower abdomen. If the patient be married, the effect of the menstrual loss may be obtained by the application of leeches to the cervix uteri; and the relief to pelvic congestion so given will favour natural menstruation at the next period. Hot foot-baths, to which mustard may be added, and the administration of a small quantity of hot dilute alcohol at bedtime, are well-known domestic remedies. Many drugs have been recommended—aloes, apiol, permanganate of potash, black hellebore, oil of savin, and cantharides—but there is none from which any effect on menstruation can be predicted.

G. E. HERMAN.

EMPHYSEMA OF THE LUNGS is a condition in which the infundibular

cavities and alveoli are dilated and the alveolar walls atrophied, the result being that the elasticity of the air vesicles is lost, and they are no longer able either to aerate the blood or to expel the contained air.

The chief *symptom* of emphysema is more or less constant dyspnœa, increased by exertion, and accompanied by a feeling of oppression across the front of the chest. As emphysema almost always occurs as a complication of some other affection, the dyspnœa is not invariably of the same character, but, as a rule, it is marked by a very prolonged expiratory effort, which is usually attended by a certain amount of wheezing. The cough which is present in emphysema associated with bronchitis is peculiar, consisting of a succession of short "hacks" interrupting a greatly prolonged expiratory effort. As many as twenty or thirty such coughs may sometimes be counted with one expiration; the patient then takes a deep breath, and again begins a series as long as the former. This may continue till he is fairly exhausted. Emphysema does not, as a rule, in the early stages affect the general nutrition, but emaciation almost invariably occurs sooner or later, coupled with the distressed and rather anxious look which is common to most cases of prolonged dyspnœa.

Physical Signs.—On inspection, the antero-posterior diameter of the chest is seen to be increased, the sternum is arched with the convexity forwards, and the angle of Ludovici is prominent; the natural curve of the spine in the dorsal region is more marked, the shoulders are rounded, the supra-clavicular fossæ obliterated, and the chest, as a whole, is "barrel-shaped." The heart is displaced downwards, and partly from this cause, and partly from the hypertrophy and dilatation of its right cavities, there is pulsation in the epigastrium.

A line of distended venules is often seen just above the margin of the costal arch, forming the so-called "emphysematous girdle."

When the patient takes a deep inspiration, the chest is raised *en masse*, but there is little or no true expansion, the increase in the thoracic space being effected by the descent of the diaphragm. The vocal fremitus is usually diminished, the percussion note is hyper-resonant, and the normal areas of cardiac and hepatic dulness may be completely obliterated. On auscultation, if the change be general throughout the lungs, the in-

spiratory sound is feeble and the expiratory sound prolonged, and, if bronchitis be present, accompanied by wheezing. Should, however, the margins only of the lungs be affected, the inspiratory sound may be harsh. Fine crackling râles are often audible at the bases posteriorly. The above description applies to a case of emphysema as ordinarily observed in association with chronic bronchitis—"large-lunged emphysema." In another form met with in aged persons the chest is small, the lungs being shrunken instead of enlarged, a change probably due to a process of chronic atrophy complicated by a certain amount of emphysema. This is termed "small-lunged emphysema." In this latter variety it is to be noted that the emphysema is often complicated with pleuritic adhesions, from which in the more common form the lungs are generally free.

Another and completely distinct affection, known as *interlobular emphysema*, is occasionally met with in children, and also in adults after injury to the chest. Strings of bubble-like prominences are seen on the surface of the lung, and correspond in direction with the interlobular septa. They may also occur in groups, giving an appearance of fine froth on the visceral pleura. This condition, when not the result of direct injury, is due to the rupture of air vesicles and escape of air beneath the pleura, or to the entrance of air into the mediastinum from the opening up of the deep cervical fascia, as sometimes happens in the operation of tracheotomy. When once the air has obtained entrance into the mediastinum, it is drawn during inspiration, and forced by violent expiratory efforts, along the sides of the bronchi, and so reaches the surface of the lung.

The *effects* of emphysema upon the heart and other organs are fully described in the article on CHRONIC BRONCHITIS; it will be sufficient therefore, here to state that they include hypertrophy and dilatation of the right ventricle and auricle, followed in the later stages by incompetence of the tricuspid valve, distension of the venous system generally, passive congestion of the kidneys and liver, gastric catarrh, albuminuria and dropsy.

Morbid Anatomy.—On opening the chest the lungs do not collapse, but may be seen completely filling the thoracic space and overlapping the heart. They are of a pale-grey tint, pigmented, and usually free from pleural adhesions. They have a soft downy feel, and pit

upon pressure. The margins generally show the most advanced changes, it being here that the large "bullæ," referred to below, are usually found. On inverting the lung, the base will be seen to form a deep cup, from the distension of its edges. The bases are usually congested and oedematous, scattered areas of collapse being often present. On examination with a hand lens, the dilatation of the alveoli will be well seen, the lung presenting a delicate spongy appearance. Fatty degeneration of the alveolar walls is occasionally found, and is by some writers believed to be the primary change.

Emphysema frequently occurs as a compensatory change when any portion of the lung has undergone contraction from disease; hence it almost invariably accompanies phthisis in the stage of arrest, and may completely mask the signs of the original lesion. In doubtful cases, therefore, the sputa should always be examined for bacilli. The change may affect the neighbouring alveoli only, or, if the contracted area be considerable, may be present throughout a whole lobe. When collapse of the whole of one lung occurs as the result of pleural effusion, or when a large area is destroyed in phthisis, the enlargement of the opposite lung is probably partly a true hypertrophy, and in part due to emphysema. It is certainly accompanied by an increase in functional activity, whereas the condition of emphysema implies a lessening of function.

When simply dilated without rupture, a condition not infrequently met with in children, it is probable that the vesicles may regain their normal size, but in advanced stages the change is permanent.

Etiology.—By some writers it is believed that the condition may arise from a congenital defect in the development of the elastic tissue of the lungs; however this may be, it is certain that the affection sometimes appears in several members of a family, but probably they have then been alike exposed to the exciting causes of the disease.

These are mainly such as give rise to sudden increase in pressure of the air within the lungs. In the act of coughing, strain is put upon the walls of the vesicles, the glottis being partially closed during a violent expiratory effort. If this be frequently repeated, dilatation of the alveoli follows, and may proceed to such an extent that the finer partitions become atrophied and break down, the alveoli coalescing to form spaces, often

of considerable size, which are termed "bullæ." Whooping-cough in early life, and in later life the chronic cough which accompanies bronchitis and phthisis, are the most common causes of the disease. Any act of straining which involves muscular effort while the breath is held, such as laborious work, lifting heavy weights, the act of parturition, and perhaps even of defecation, tends in the same direction. Expiratory dyspnoea, from whatever cause, and especially that of spasmodic asthma, is also liable to set up emphysema. Certain occupations, such as glass-blowing and the playing of wind instruments, conduce directly to it; and in any laborious calling where persons are obliged to undertake great exertion when they are more or less "out of breath," the same change may occur. The longer the patients are exposed to the influences which produce increased pressure of air within the lungs the more widespread does the mischief become.

Treatment.—The chief object of treatment should be to prevent as far as possible any increase of the affection. If it be due to any definite exciting cause, such as playing a wind instrument, the indication is clear; if it complicate chronic bronchitis, the patient must avoid as far as possible anything which may give rise to catarrh of the respiratory passages. Over-exertion of any kind must also be avoided, although active outdoor exercise should be insisted on, but it is of especial importance to restrain patients from allowing themselves to get "out of breath." Rowing, football playing, or any sport entailing occasional excessive exertion should be forbidden, and hill walking must only be undertaken in moderation, and at a reasonably slow pace. The tricycle affords an excellent means of exercise for emphysematous persons. Relief has in some cases been given by means of exhalation into rarefied air. The residual air which the diminished expiratory power is not sufficient to expel is thus drawn out of the vesicles, and for the time relieves their hyper-distension. For a description of the apparatus necessary to carry this treatment out, *see* AIR, RAREFIED, THERAPEUTICS OF.

For further information as to the treatment of emphysema the reader is referred to the article on CHRONIC BRONCHITIS. E. CLIFFORD BEALE.

EMPYEMA.—An empyema is a collection of pus within the pleural cavity. In some cases the fluid is purulent from

the first, but far more frequently the effusion is primarily serous.

Symptoms.—The expression is anxious, and there is often a marked degree of wasting and general pallor. The temperature is high and fluctuating, and of the hectic type. Rigors and sweating are often present, but there may be complete absence of fever when the case first comes under observation. There is usually increased frequency of the pulse and respiration, and, in addition to the above, there are the special symptoms of pleuritic effusion, for which the article on PLEURISY should be consulted. A rise of temperature over the surface of skin covering the dull area has been observed, but this is not always found. Oedema of the affected side of the chest is present in some cases, but it has been also noted when the fluid proved to be serous. The collection of pus may be limited by pleural adhesion to a very small area, a condition often difficult of diagnosis, and particularly so when the empyema is situated between the base of the lung and the diaphragm.

If the fluid be allowed to remain, spontaneous rupture through the chest wall, or "pointing" of the pleural abscess, may occur, generally about the fifth interspace in the nipple line. The contents of an empyema may also burrow through the subcutaneous tissues to distant parts, ultimately either appearing on the surface as a pointing abscess or discharging into some cavity. A neglected empyema, however, more often discharges through the lung than in either of the above-mentioned ways. The chief dangers to be feared in cases of empyema are the occurrence of cerebral abscess, acute tuberculosis, and, after operation or spontaneous rupture, of albuminoid disease.

After the removal of the pus the lung may in recent cases expand to a considerable extent; other changes which aid in obliterating the cavity are the contraction of the affected side of the chest, the displacement of the mediastinum, enlargement of the opposite lung, and the upward movement of the diaphragm. Ultimately the process of closure is completed by the growth of granulation tissue within the empyemal sac.

Diagnosis.—As stated in the article on PLEURISY (*q.v.*), the positive diagnosis of empyema can only be made by means of the exploring syringe, which should always be used whenever the presence of pus is suspected.

In a few very rare instances a general

pulsation, synchronous with that of the heart, has been felt over the whole area of a large empyema, and has led to a mistaken diagnosis of aneurysm. On the withdrawal of a few ounces of fluid, the pulsation may cease altogether, owing to the relief of tension. In rapid and acute effusions the shreds of lymph and leucocytes tend to gravitate to the lower parts of the pleural cavity, and, if the exploring needle be introduced in any of the lower intercostal spaces, a turbid—almost purulent—fluid is withdrawn, and may give rise to the false impression that the whole chest is full of pus. In any case of doubt, therefore, a second exploration should be made at a higher level.

Etiology.—The condition is much more common in children than in adults, but may occur at any age as a sequel of acute pleurisy, especially when the latter affection is a complication of septic inflammation elsewhere, or occurs in the course of the infective fevers, and especially small-pox. In the subjects of malarial poisoning, also, a serous effusion is very apt to become purulent, and an acute tubercular pleurisy may also result in empyema.

Treatment.—If the presence of an empyema be discovered by the use of the aspirator, no harm can be done by withdrawing as much of the pus as will flow through the needle, and in some rare cases in children a cure has been thus effected without further operative interference. If, however, the diagnosis be made by the use of an exploring syringe, it is seldom advisable to proceed to paracentesis, as aspiration is usually followed by a rapid re-accumulation of the fluid. A free incision through an intercostal space, followed by the insertion of a drainage-tube, is then the only effective method of treatment.

The exact site to be chosen for the opening must be determined by the circumstances of the case. It is usually best to select a spot about two interspaces above the lower level of the dull area, as, if the opening be made at the lowest point, a long sinus may remain after the chest has contracted, and there may be great difficulty in getting it to heal, whereas the choice of the higher site ensures the opening being opposite to that part of the cavity which is usually the last to close. The sixth or seventh interspace in the mid-axillary line is, generally speaking, the most convenient region in which to open the pleura.

For the details of the surgical treat-

ment of empyema other works must be consulted; only the general principles can be given here. It is in the first place of the greatest importance to secure free drainage for the pus, and to prevent the access of septic air to the cavity. Washing out the sac with warm aseptic solutions (*e.g.*, corrosive sublimate, 1-2000) is a proceeding often recommended, but not quite free from danger, as in several cases severe shock, and in a few sudden death, has occurred during its performance—results possibly due to the fact that insufficient provision was made for the free exit of the fluid injected. If this be done, and care be taken not to inject the fluid faster than it can escape, the proceeding is probably free from risk. In children, and in adults when the intercostal spaces are narrow, it is generally advisable to remove a portion of a rib at the time of opening the empyema, and, should there be much caseous-looking material or curdy pus within the cavity, or a thick membrane on its walls, it should either be washed out by inserting the nozzle of the irrigator beneath it, or scraped away by means of a sharp spoon guided by the finger. "Perflation," or blowing purified air into the sac, has been recommended with the same object, but is a less efficient measure and not free from risk. The injection with a syringe of an ounce or rather more of iodoform emulsion (iodoform 10 per cent., glycerine 70 per cent., water 20 per cent.), after scraping the interior of the sac, has been found of service in some cases. An aseptic condition of the sac may also be secured by placing the patient in a warm-water bath to which some antiseptic solution such as Condy's fluid has been added, the water flowing in and out with the respiratory movements.

If, in spite of long-continued free drainage, and the occurrence of all possible compensatory changes, such as contraction of the chest, displacement of the mediastinum and diaphragm, and some expansion of the lung, the empyema still remain unhealed, it may be necessary to remove longer pieces of several ribs, or even the greater part of one side of the thorax with the thickened pleura, in order to secure the complete obliteration of the cavity. This latter operation is known as "Estlander's" (thoracoplasty); it is a very severe proceeding, and should only be performed when life is threatened from the weakening effect of prolonged suppuration and the super-venion of albuminoid disease. In one recorded case 54 inches of bone were

thus removed—an average of 6 inches for each rib.

The possibility must always be borne in mind that two or more localized empyemata may exist in the same chest. Hence, if relief to the symptoms be not given by free evacuation of the pus, the chest must be carefully examined to ascertain whether a second collection be present. If any such be found, it must be promptly emptied by the same means. Cases of pyo-pneumothorax not of tubercular origin, or empyema ruptured into the lung, are generally best treated upon the lines here laid down.

In the after-treatment of cases of empyema in which free drainage has been established, attention must be directed toward the maintenance of the general health, which will certainly suffer from the exhausting effect of prolonged suppuration. For this purpose, iron, quinine, and cod-liver oil are the best remedies. Burgundy or port wine may also be allowed. Gentle gymnastic movements of the chest may be useful to promote the re-expansion of the lung and the growth of muscles wasted from disuse, but should not be attempted until at least three weeks after the closure of the wound.

E. CLIFFORD BEALE.

ENDEMIC.—A disease is said to be endemic when it affects a particular locality or district, and results from local conditions there existing. Malarial fever is one of the most characteristic examples of an endemic disease.

ENDOMETRITIS means inflammation of the uterine mucous membrane.

Although this is commonly spoken of as a morbid condition existing by itself, it must be remembered that disease of the mucous membrane is usually accompanied by changes in the muscular tissue beneath, and that disease of the muscular tissue of the uterus is accompanied by change in the mucous membrane. When endometritis is spoken of it is meant that the affection of the mucous membrane is the chief morbid condition present, and not that it is the only one.

Endometritis may affect the cervix or the body of the uterus.

(1) **Cervical endometritis**, leading to the production of the condition variously known as "erosion," or "ulceration," or "granular degeneration" of the cervix, is one of the commonest morbid conditions to which the uterus

is subject. The granular erosion is always accompanied by inflammation of the mucous membrane. Catarrh of the cervix may probably occur alone, but its symptoms are then insignificant. The erosion presents different appearances. The *simple* erosion either appears as a ring around the os uteri or as a patch on its anterior or posterior lip, which has lost its smoothness, and is of a deeper red than the healthy tissue. The *granular* erosion is a patch, similar in situation, which looks to the naked eye like a granulating ulcer. In the *papillary* or cock's-comb erosion there are projecting soft papillary growths. The *cystic* erosion is that in which, beside the granular or papillary condition, hard shot-like lumps, of the size of a hemp-seed or of a pea, but sometimes larger, are felt in the tissue, from which, when cut into, thickened secretion, either glairy or purulent, flows. Sometimes these cysts hang down into the cervical canal. In this condition they have been given the fanciful name of *ovula Nabothi*. These are all different stages of the same morbid condition.

Symptoms.—By the formation of new glands the secreting surface of the cervix is increased, and leucorrhœa results. In chronic cases this is the only symptom. In recent cases there is often vascularity of the whole cervix, which becomes swollen and club-shaped rather than conical, and the canal is dilated. In such, beside leucorrhœa, pain in the back and ovarian regions, menstrual pain, and slightly increased menstrual flow are also present. But the disease is never more than a minor disorder. It is often accompanied by disturbance of the general health, such as loss of appetite, dyspepsia, and nervous symptoms; but there is quite as much reason to think that the condition of health leads to the production of the erosion as that the erosion disturbs the general health. The truth is, that the general condition and that of the cervix react on each other. The disturbance of health is often largely the result of the patient's fears.

Prognosis.—The affection, if of recent date, is curable, but if chronic it is either incurable, or not worth the cost of cure.

Pathology.—Different opinions are held as to the mode of origin of the morbid process, whether it begin in the epithelium or in the connective tissue; but there is no doubt as to the nature of the changes when developed. The affected part, which in health is covered by several

layers of squamous epithelium, now has only a single layer of cylindrical epithelium. There is a formation of gland tissue, the size and number of the newly formed glands varying with the advance of the change. There is also proliferation of the connective tissue between the glands. The intervening processes form the granulations or papillary outgrowths which are seen by the eye. Sometimes the mouths of the glands become closed and their secretion is retained, the result being the formation of the cysts above mentioned.

Etiology.—The chief cause of inflammation of the cervix is injury in parturition. Cold, retroflexion, gonorrhœa, ill-adjusted pessaries, and morbid sexual excitement may also give rise to the condition. Though rare, it is sometimes met with in the virgin.

The *treatment* consists in the administration twice daily of a hot vaginal douche (110°–112° F.) for five or ten minutes at a time. The use, once or twice daily, of plugs of cotton-wool soaked in glycerin, or, preferably, of a glycerin pessary (gelatin gr. xx, glycerin ad 3ij), or, if there be pain and the secretion purulent, a boric acid pessary (as above, with gr. xx of boric acid) is beneficial. Once in from five to seven days the cervix should be cauterized. A Ferguson's speculum having been passed, adherent secretion should be wiped away from the cervix with a mop of absorbent wool in the grasp of a speculum forceps; the cervical canal should then be cleaned with cotton-wool wrapped round a Playfair's probe, and a solution of carbolic acid 7 parts, water 1 part, applied to the eroded vaginal portion with a piece of wool held by the forceps, and to the cervical canal with Playfair's probe. Some of the carbolic acid will flow into the upper part of the vagina, but this is of no consequence; care must, however, be taken to mop it up before withdrawing the speculum, as, if any reach the vulva, it will cause much pain. Before applying the caustic, any cysts that are seen should be punctured and their contents let out. Tonics and laxatives should be prescribed, and alcohol forbidden.

In a recent case cure may be expected in about six weeks. If after two months' treatment the local condition be unaltered, cauterization should be given up. If the mode of cauterization above described seem unproductive of benefit, a zinc-alum point may once only be placed in the cervical canal and left there. If the cervix be lacerated and

everted, and if, after the cervix has been once or twice restored to a healthy condition, relapse take place, the lacerations should be repaired by Emmett's operation, and the cervix restored to its natural shape. If the cervix be much elongated and thickened, amputation of the vaginal portion is the best treatment.

(2) **Endometritis of the Body of the Uterus.**—**Acute endometritis** is of rare occurrence apart from other disease, of which it may be either the cause or consequence.

Endometritis occurs in the course of certain acute diseases—small-pox, enteric fever, typhus, cholera, phosphorus poisoning, and measles. In these diseases the symptoms caused by the endometritis are at the time quite overshadowed by the general condition of which it is one of the results. It may leave behind fungous or purulent endometritis.

Endometritis may be a result of retention and decomposition of ovuline structures. In this case, if there be nothing more than endometritis, there will be simply a copious offensive purulent discharge. The *treatment* consists in the removal of what is retained, and in washing out the uterine cavity with 1 in 2000 corrosive sublimate solution. It may be associated with septicæmia, or with uterine phlebitis, or pyæmia, or peritonitis, in which case it will be of little importance as compared with the other far graver conditions present.

Endometritis may be a result of gonorrhœa. This, although it may protract the disease, does not materially alter the symptoms, unless the Fallopian tubes become involved, in which case the endometritis sinks into relative insignificance, both as regards danger and as a cause of suffering.

Endometritis may result from the decomposition of retained menstrual fluid after most of it has been let out. This is to be prevented by careful attention to antiseptic details.

It is believed that endometritis may arise from chill during menstruation, slight attacks of perimetritis coming on in such circumstances being attributed to endometritis extending along the tube. It may result from sexual excesses. Such cases are marked simply by hæmorrhage and sanious discharge, without physical signs, and get well with rest in bed and avoidance of the cause.

Fungous or hæmorrhagic endometritis occurs in two forms—(1) *chronic hyperplastic* endometritis, in which the

body of the uterus is slightly enlarged and its cavity expanded. The lining membrane is hypertrophied, lying in thick folds, which are soft and easily detached. The structure is normal, except that it is more vascular; the glands may be dilated, and there is a round-celled infiltration. In (2) the *polypoid* form there are distinct circumscribed outgrowths, which may be composed of glandular tissue or of granulation tissue, or chiefly of vessels.

Symptoms and Diagnosis.—The important symptoms are irregular and rather profuse hæmorrhages, and in the intervals a thin rusty or pink discharge. Pain is slight. The disease is important on account of the resulting anæmia. On vaginal examination, nothing abnormal is perceived. On bimanual examination, the uterus is found slightly enlarged. The introduction of the sound produces hæmorrhage and reveals slight elongation of the cavity. With these symptoms and signs, the proper course is to dilate the cervical canal with Hegar's dilators, and explore the uterine cavity with the finger. Then either the thickened, readily detachable mucous membrane or the polypoid growths will be felt.

Ætiology.—Fungous endometritis is often a sequela of labour or abortion, or acute disease. It may occur in the virgin. It is more common near the climacteric, and has been attributed to a morbid influence exerted by diseased ovaries; but our knowledge of its causation is far from definite.

The *treatment* is to scrape away the diseased lining membrane with a blunt curette, and then to cauterize the interior of the uterus with nitric acid or with 1-6 solution of perchloride of iron. This treatment will at least stop the symptoms for some months. Relapse may occur, especially in the hyperplastic form, but cure may eventually be expected.

Chronic purulent endometritis is seen in old women, often in association with closure of the cervical canal. The body of the uterus is dilated and thinned. If there be free exit for the discharge, there is little pain, and the purulent discharge is the chief symptom. If the canal be closed, on opening it pus will escape.

The chief importance of this disease is that it gives rise to a suspicion that cancer is present, and it may be necessary to explore the uterine cavity in order to establish the diagnosis.

Treatment.—If uncomplicated, the purulent discharge can be stopped by maintaining free patency of the cervical canal, and injecting 3j-5ij of a 3ss ad 3j solution of silver nitrate into the uterine cavity. This may be repeated in four to seven days, if necessary.

G. E. HERMAN.

ENEMA.—A fluid injected into the rectum. Clyster is the old name.

The most common use of enemata is to open the bowels. For this purpose simple water or soap and water (Oj-ij) generally suffices, but olive oil (3iv) or castor oil (3j) may be added; in cases of intussusception infants' milk has been advantageously used. Astringent enemata are often employed to check diarrhoea, 2 ounces of starch solution with $\frac{1}{2}$ drachm of laudanum being the most efficacious.

Sometimes it is necessary to feed patients by the bowel. Nutrient enemata are usually made of strong beef-tea (3iij-iv) with brandy and yolk of eggs, or peptonized milk may be substituted for the beef-tea; a nutrient enema should not exceed 6 ounces. It is important to wash out the rectum carefully before each nutrient enema. Enemata of salt and water, or of infusion of quassia, are serviceable against thread-worms; 2 to 4 ounces of fluid may be injected for this purpose. The enema opii is useful in painful affections of the rectum or bladder.

ENURESIS (Incontinence of Urine).—Involuntary micturition either during the night only, or both by day and night, is a not infrequent and sometimes very troublesome affection of childhood. It may exist from birth, but more commonly commences about the third or fourth year, or not till the seventh. When it takes the form of dribbling both by day and night, it may in some measure be due to indolence and indifference, but when nocturnal only, such a causation is very doubtful. The condition is almost equally common in the two sexes.

Setting aside such obvious causes as malformation of the bladder or ureters, and stone in the bladder or kidneys, it has been found to be due to the presence of ascarides, rectal polypi, vulvitis, a contracted orifice of the urethra, spasmodic stricture, phimosis, or adherent prepuce; and in girls, to vascular growths at the orifice of the urethra. Sometimes the urine is too acid or too alkaline, whilst

in certain cases disease elsewhere (e.g., morbus coxæ) has appeared to act as an exciting cause.

Sometimes no cause can be found, and in such cases there are good reasons for regarding the condition as analogous to somnambulism, or even to epilepsy, a further reason for this view being that it is sometimes hereditary, and may occur in families where epilepsy or some neurotic taint is inherited. Some subjects of the affection are of deficient intellect, the condition being very common among idiots; but, on the other hand, it may affect unusually precocious children. It has been said that the incontinence is due to lying in too luxurious a bed, but this can hardly have much effect, as it is very common amongst the children of the poor and in children the subjects of general debility. The child may dream that he is in a proper place for micturition; more probably, however, the dream follows on the act of micturition. Some hold that incontinence occurs only during the deepest sleep; others, that it takes place when there is a tendency to waking. The discharge of urine may take place every night, or several times during the night, or only at intervals of a few days. In recent cases some cause will generally be found, often a gastro-enteritis; subsequently, however, it becomes a habit, and is continued long after the cause has ceased.

The total quantity of urine may be increased, which has given rise to the suggestion that in some cases diabetes may have been present.

The *pathology* of the affection is very obscure; the bladder seems to be unduly excitable, and the contractile power of its muscular coats is in excess. When the incontinence occurs by day as well as by night, it is to be presumed there is, in addition, atony of the sphincter. On the other hand, the centre in the lumbar enlargement may be at fault, as the result of some local or general want of tone in the nervous system. Such a constitutional state, it has been pointed out, is occasionally met with in association with rheumatism. It is highly probable that in some boys the conditions which give rise to nocturnal incontinence are analogous to those which, at a later age, produce seminal emissions, for priapism is occasionally found, and the subjects of it have, it is said, in after-life suffered unduly from nocturnal pollutions or have been addicted to masturbation.

Spontaneous recovery takes place in many instances at the period of second

dentition or at puberty. The complaint is said to be more inveterate in girls than in boys, possibly because in them the causes are not so well understood.

Treatment.—Punishment should never be resorted to unless there be very good reason for suspecting that the act is the result of carelessness, for fear is only likely to make matters worse, and may cause serious impairment of the general health. All sources of local irritation should be removed or treated. Attention should be paid to the diet, and the amount of fluid that the child is allowed should be regulated, none being given for two hours before bedtime. The child should always be made to micturate immediately before getting into bed, and should be awakened and taken out of bed once or twice during the night to pass water, and each time he should be thoroughly aroused. The patient should not be allowed to sleep on the back; to prevent this a blister may be applied over the sacrum, or a brush or some hard substance be tied to the pelvis. It is a good plan to raise the foot of the bed on bricks, so that the pelvis may be lower than the feet; the urine as it collects in the bladder will then gravitate to the fundus and not to the neck, and the reflex act of micturition is less likely to be set up. Sponging the back and loins with cold water and wrapping the feet in cold wet towels have been recommended.

If the urine be too acid, the allowance of meat should be reduced, and bicarbonate of potash or liquor potassæ administered internally; if too alkaline, phosphoric acid should be given, as it is very desirable to keep the urine as nearly neutral and as non-irritating as possible. In recent cases perchloride of iron and nux vomica may be given, whilst in the more chronic cases belladonna usually gives the best results. Small doses of the tincture or extract should be administered at midday and in the evening, the dose being gradually increased until some physiological effects are obtained, when it may be diminished. The drug should be continued for some weeks after apparent cure has resulted. In certain cases, especially when the incontinence is both diurnal and nocturnal, strychnine sometimes answers better. Belladonna increases arterial tension, and acts partly on the vesical centre and partly by paralysing the muscles of the bladder. Ergot, bromide of potassium, benzoic acid, digitalis, borax, and chloral hydrate have also been found of service.

The passage of a sound or the application of a 10-grain solution of nitrate of silver to the urethra once a week has occasionally proved beneficial. It is useless to attempt to occlude the urethra by mechanical means. Galvanism may be tried, the positive pole being applied to the back, and the negative indiscriminately to the perineum, scrotum, and hypogastrium; or a shock from an induced current may be given.

EPIDEMIC is a qualifying term used in medicine to signify that the disease to which it is applied affects, during a limited period or periods, a large proportion of the members of a community, nation, or nations.

Though properly an adjective, it is frequently used as a noun, a practice which has led to much confusion. Though it ought not to be understood as involving any ætiological theory, it is frequently used as an equivalent for "contagious," "infectious," or "communicable," owing to the fact that such diseases have all, with possibly a few unimportant exceptions, been known to occur in an epidemic form. It may be said of every epidemic disease the history of which is well known (with the exception of influenza), that it may be proved to exist always among some community or communities. Thus, Asiatic cholera is never absent from the delta of the Ganges; enteric fever is never absent from Great Britain.

When a disease is constantly present it is termed *endemic*, and the country or region in which it is present is termed an endemic area of that disease, and it is assumed that special demological or climatological conditions exist within this area which favour the development of the disease. It would appear that at irregular intervals these favouring circumstances become intensified within the endemic area, and are also brought into existence beyond its borders; cases of the disease then increase in number, and occur in batches or sequences related in place and time, and there is then said to be an epidemic prevalence of the disease. When the disease prevails in succession in a very large number of countries the term *pandemic* is used: thus, in 1847-48 there was a pandemic prevalence of influenza, and in 1869-73 of small-pox.

The causes which favour each one of the epidemic diseases vary, and will be discussed under the head of each disease,

but it is now almost universally admitted of all the epidemic diseases that the most essential condition is the pre-existence of a case or cases, and that such diseases have a specific origin; further, modern epidemiological and bacteriological observations render it in the highest degree probable, to say the least, that the essential condition is the transference, either directly or mediately, of a *materies morbi* from the sick to the healthy, and that other conditions, social or climatological, operate only by favouring this transference.

Measles, scarlet fever, and small-pox are typical examples of epidemic diseases commonly communicated directly from the sick to the healthy; enteric fever and cholera, of diseases in which the connection between the earlier and the later case is commonly mediate (water, food); but epidemic diseases cannot be classified on this basis, owing to the numerous exceptions in both directions. The origin *de novo* of these diseases can be neither affirmed nor denied, but if it ever occur it must be an extremely rare event.

The degree to which an epidemic disease which has appeared in a community will prevail may be in certain cases to some extent foretold. Certain epidemic diseases, as yellow fever, are checked and finally extinguished by cold weather. In the case of epidemic diseases one attack of which confers complete or partial immunity, the number of susceptible individuals may be known or inferred from the extent of previous epidemics, or, in the case of small-pox, from the proportion of persons efficiently re-vaccinated. In the case of epidemic diseases, such as enteric fever, which are commonly water-borne, the condition of the water-supply and general sanitary state will enable a forecast to be made. The mortality from a disease and the severity of the cases vary remarkably in different epidemics. No explanation of the variation in "type" has ever been afforded, although M. Pasteur's observation of the attenuation of virus (especially in anthrax) may suggest one. It has been supposed that certain epidemic diseases stand in some causal connection with each other. For example, it has been asserted that the epidemic prevalence of cholera is always heralded by an increase of the number of cases of diarrhœa and "bowel complaint," and that a prevalence of whooping-cough is preceded by a prevalence of measles. The grounds upon which the theory of "precursors"

rests, however, appear to be insufficient, the examples quoted in its support being probably merely instances of concurrence.

DAWSON WILLIAMS.

EPILEPSY.—A sudden attack involving loss of consciousness with or without convulsions.

Epilepsy occurs in two forms: (1) *petit mal*—i.e., loss of consciousness without convulsions; (2) *haut mal*, or loss of consciousness with convulsions, which are usually general. Another manifestation of the disease is an *epileptiform seizure*, in which localized convulsions occur without loss of consciousness.

As epileptiform seizures are most frequently associated with cerebral tumours, they are described under BRAIN, TUMOURS OF.

Symptoms.—The attack may begin suddenly with loss of consciousness; or the patient may experience various sensations before the fit, called the *aura*, or *warning*.

The *aura* must be considered as quite as much a part of the fit as the subsequent convulsions. The word "aura" was originally used to denote the feeling which some epileptics describe as that of a current of air passing up the limb. This aura, or warning, although referred to the periphery of the body, is really the expression of some discharge taking place in the area of the cerebral cortex in which this particular part of the periphery is represented, and by means of a definite aura, such as tingling in the great toe or the thumb, we are enabled to localize the particular part of the cortex in which the discharge is taking place. The extent and duration of the aura—i.e., the amount of the fit of which the patient is conscious—is determined by the point of time at which unconsciousness ensues; this varies in different cases, and even for different fits in the same individual. An aura occurs in about one-half of the cases, and its duration varies from a few seconds before consciousness is lost to an hour or even a day.

An aura may take the form of (1) a feeling of malaise, headache, tremors and starting of all the limbs, which may last for a whole day before consciousness is lost.

(2) Unilateral sensations in the face, tongue, arm or leg, either sensory, as tingling, numbness, pain, which may be followed by motor symptoms in the part affected, or the motor symptoms may be primary. The sensory symptoms usually precede the motor, and most often affect

the extremity of the limbs. The patient feels a numbness or tingling in the hand or foot; this runs up the limb, and is followed by a contraction of the fingers or toes (usually flexion), and then by flexion of the elbow or knee; or, after tingling is felt in the face, the corner of the mouth is retracted. The motor symptoms may be felt without the sensory tingling, but it is not common for the latter to follow the motor symptoms. Sometimes the patient feels his head being turned towards the same side as the affected limbs.

(3) Epigastric sensations. The patient experiences curious feelings, such as coldness, burning, numbness, or a feeling of weight, which begins either in the abdomen, often at the epigastrium, or in the left side of the chest, and passes upwards along the left side to the throat or head. The aura follows the course of the pneumogastric nerve, and causes palpitation of the heart, dyspnoea, and a feeling of choking; it is sometimes described as if the intestines were being "wound up."

(4) Psychical, a peculiar dreamy state. Some idea comes into the patient's mind, or there is a sense of something horrible and of great terror.

(5) Vertigo, or a sense of giddiness. The patient feels he is turning round, or objects seem to revolve round him, or both patient and objects appear to revolve at the same time and usually in the same direction; sometimes there is the feeling as of falling down a hole or over a cliff.

(6) Special sense auræ may be (i.) visual, including loss of sight, pain referred to the eyeball, the appearance of bright or coloured lights, or of distinct images of people or views; (ii.) auditory, as noises in the ears, buzzing, humming, ringing of bells, or distinct tunes; (iii.) olfactory; (iv.) gustatory, usually of an unpleasant nature.

In a typical severe epileptic fit the patient, with or without a warning, suddenly loses consciousness, falls down possibly into a fire, or against the furniture, often hurting himself severely, sometimes cutting the head or sustaining severe blows; at the same time he often gives "the epileptic cry"—a wild, unearthly scream or yell, which is probably produced by a sudden expulsion of air through the contracted larynx by the tonic expiratory movement of the thorax. Tonic spasm, either of the muscles of both sides of the body or of one side only, then occurs. In the majority of

cases one side of the body is affected before the other; the head and eyes are turned to one side; the corner of the mouth of the same side is retracted; the fingers are flexed in the interosseal position; the elbow is flexed and the arm adducted. The leg of the same side is also affected, the toes, as a rule, being extended, whilst the knee and hip are flexed; the trunk is often rotated to the side to which the head and eyes turn. The same muscles of the opposite side are subsequently involved, though to a less degree, but if the attack begin on both sides at once, the muscles of both sides will be simultaneously involved. This, however, is not so common, and the writer believes that in the great majority of cases, if the fit be observed at the very onset, one side will be seen to be affected before the other.

The tonic condition lasts only a few seconds, and its exact character is therefore very difficult to analyse with absolute accuracy. It gradually merges into the clonic stage, the initial tonic contractions passing into intermittent clonic spasms. The spasms of the side primarily affected are the first to assume the clonic character. The head and eyes and the corner of the mouth are rapidly jerked towards one side; the fingers are spasmodically flexed; the elbow presents a series of flexions; and the whole leg is drawn up and jerked. The opposite side of the body is then affected by the clonic spasm in a similar way, either synchronously with its fellow or a few seconds later. Both sides then contract simultaneously, and the whole body is thrown into violent clonic contractions, the muscles of the abdomen and trunk being affected as well as those of the limbs and head. In this stage the pupils are widely dilated and do not react to light, and the conjunctiva has lost its reflex. The tongue is usually bitten, from being thrust out between the teeth and caught by the lower jaw in clonic spasm. Urine and occasionally fæces are voided unconsciously, and, very rarely, semen is said to be ejected. The face, which in the tonic state may have been pale or unaltered, becomes intensely cyanotic during the clonic condition; the pulse, perhaps feeble at the commencement of the attacks, becomes rapid and stronger in the clonic stage, but, in the writer's experience, it does not cease altogether as the fit begins, and stoppage of the heart's action cannot, therefore, be considered as the cause of an epileptic fit.

The excursions of the clonic spasm gradually become slower and longer and at last cease, muscular relaxation occurring first on the side primarily affected. The patient now lies in a comatose state, with loud rapid stertorous breathing; the face is intensely cyanotic, but becomes less so as breathing is re-established; the limbs are quite flaccid and paralysed, or they may become slightly rigid; the pupils are widely dilated and insensible to light, and the conjunctival reflex is absent. If the fit began with turning of the eyes to one side, it is frequently observed, immediately *after* all clonic spasm has ceased, that both eyes are turned conjugately to the opposite side (observed by the writer in nine out of eleven fits where it was looked for), so that we have here a deviation due to paralysis of the muscles most involved in the fit. This condition lasts for about three minutes, and then the eyes roll from side to side and the pupils oscillate, alternately contracting and dilating.

The knee-jerk may be absent after a very severe fit, but more often it is excessive, and ankle clonus can be obtained for from three to five minutes after clonic movements have ceased; it is often more marked on the side on which the initial tonic spasm occurred. Gradually the plantar reflex, which is at first absent, and the conjunctival reflex return, the pupils become smaller and react to light, and the patient shows signs of uneasiness and may make some incoherent remark, but more often relapses into sleep, on awaking from which he complains of headache and malaise. Before completely recovering consciousness the patient may perform various automatic acts of which he has afterwards no recollection.

In some cases mental derangement is present directly after the fit, attended with acts of violence; or there may be extreme irritability, lasting for some hours or days. The general mental condition of epileptics is frequently very defective.

Minor Attacks (Petit Mal).—These are slight attacks of loss of consciousness without any convulsion. There may be no aura, or the patient may experience a slight feeling of giddiness or faintness, or a sudden start of the whole body, or some mental idea. He suddenly stops in the midst of a conversation, looks strange, the eyes become fixed or vacant, he drops anything he may have in his hands, becomes flushed or pale in the face, or the colour of the face does not alter at all.

If standing at the time, the patient rarely falls; if sitting, he may merely lean back in his chair. Urine is frequently passed involuntarily. The attack only lasts a few seconds, consciousness then returns, and the patient goes on speaking as if nothing had happened. The reflex action of the pupils and conjunctiva is quite abolished during the attack. Slight twitching of the face is occasionally noticed, but nothing approaching to a convulsion. Immediately after one of these attacks patients are very liable to perform automatic actions, such as beginning to undress themselves, taking things out of a cupboard, or going into shops and making absurd requests.

The *diagnosis* of an epileptic fit, and especially of petit mal, has to be made from attacks of *syncope*. In the latter the loss of consciousness is distinctly associated with weakness of the heart's action; the onset is not so sudden, the attack usually lasts longer, is often brought on by some obvious cause, as a hot room or an unpleasant sight, and is unattended by involuntary micturition. In *auditory vertigo*, or Menière's disease, there is usually deafness to sounds conducted through the bones of the head as well as through the air, also noises in the ears, and frequently vomiting, but rarely loss of consciousness.

Hysterical fits differ in that the patient falls more gradually; screaming occurs while convulsions are taking place; the convulsions are purposive, as fighting and biting other people; the limbs are very rigid; there may be opisthotonos and squinting; the tongue is held between the teeth, but is not bitten; there is absence of involuntary micturition, and the pupils and conjunctiva usually react to stimuli. The duration of these attacks may be half an hour or more, and the patient may recover quite suddenly; whereas, epileptic fits rarely last more than a few minutes, and are, as a rule, followed by sleep or headache. A pinch of snuff is often a useful diagnostic test, producing a reflex sneeze in hysterical cases, but not in epileptics.

Malingering must not be overlooked.

In *convulsions* due to uræmia, albumen is present in the urine, a condition which is not found in ordinary epilepsy.

The *prognosis, as regards life*, is not unfavourable, as patients very rarely die in a fit, but if not carefully watched, the danger to life is very serious from falling into water or fire, or from suffocation in bed or while eating. As regards *cessa-*

tion of the fits, it may be stated that this rarely occurs spontaneously, and that about one-tenth of the cases are not improved by any kind of treatment. The prognosis is the more favourable when the fits begin after the age of twenty, and are inherited, and when there is an aura, and less so when the fits occur very frequently, when the major occur in association with minor fits, and when there are marked mental changes (Gowers).

Pathology.—The pathology of epilepsy has been very much advanced in recent years, mainly owing to the labours of Hughlings-Jackson. The seat of the disease was formerly considered to be in the medulla oblongata, in the "convulsive centre" of that region; it was subsequently thought to be due to a general vaso-motor contraction, producing anæmia of the brain, and so convulsions. Although some convulsive seizures may be due to disease or changes in the medulla, it is now considered most probable that nearly all true attacks of epilepsy have their origin in "discharges" of energy from the cells of the grey matter of the cerebrum, especially those of the cortex, which may be called the seat of convulsions. How the discharge is produced is not quite evident, but it is assumed that the nerve cells of the cortex are charged reservoirs of energy, and that in epilepsy the resisting power to this discharge is diminished. The resistance being overcome, the discharge spreads from the starting-point along the lines of least resistance in the cortex, and, by exciting other cells in the neighbourhood, produces the phenomenon of an epileptic fit. In an attack of petit mal the discharge is limited to the highest centres, and does not usually involve the motor centres.

Etiology.—*Predisposing Causes.*—*Sex.* Both sexes are liable to this disease, but females rather more so than males, the proportion being 6 to 5 (Gowers).

Heredity has a very decided influence in predisposing to epilepsy. Different observers give from 28 to 35 per cent. as the frequency with which some form of nervous disease exists in the family. This is most frequently epilepsy, several members of a family often suffering. Insanity and chorea are also met with.

Age.—The age at which epilepsy is most likely to make its first appearance is important. A great many cases begin in infancy at the teething period, during the first eighteen months. The fits then either persist, or recur after an interval, possibly at the second dentition or at

puberty. The period of second dentition, at seven years, is also a predisposing age, but the time when epilepsy is most prone to occur is the age of puberty, fourteen to sixteen. No age up to seventy is exempt, but it is uncommon for the disease to appear after the age of thirty-nine or forty.

Exciting Causes.—In a great many cases no distinct cause can be made out although the friends frequently assign as a cause some event which may have occurred months previously to the first fit. In 37 per cent. some reliable cause may be found (Gowers), the most frequent being a fright, immediately or a few hours after which the fit may occur. Traumatic causes, especially blows on the head, are not uncommon, the fit occurring immediately or shortly after the blow. *Ascarides* frequently produce epilepsy. Acute specific fevers (especially scarlet fever), asphyxia, pregnancy, and masturbation are by some accredited as causes, but the influence of the last was formerly much overrated; it is more probably the result rather than the cause of the disease. Severe mental anxiety or worry is also an exciting cause.

Treatment.—The drugs which have more effect on epilepsy than any others are the bromides of potassium, sodium, and ammonium. It is best to administer one salt at a time, and not a combination of them, so that, if one lose its effect, another may be tried with advantage. The bromide of potassium is most commonly used, but the ammonium salt certainly seems to produce less depression and less tendency to bromism.

The *time* of administration of the drug and the *dose* are important. If the fits occur at various times, gr. xv-xx should be given three times a day before meals; if the fits only occur at night, or in the early morning, gr. xl-5j should be given at bed-time; while, if the attacks come on in the morning whilst dressing, gr. xl should be taken on awakening, and the patient should stay in bed for an hour after.

With the same daily dose it is well to vary the mode of administration—i.e., to give 5j either in two doses of grs. xxx night and morning, or in three doses of gr. xx. Another plan of administering the drug is to begin with a small dose (e.g., gr. xv.), and to gradually increase it until the fits cease. It is important not to omit the bromide too soon. The dose which has stopped the fits should be persevered with for a whole year, and very gradually diminished for

another year, if no fits occur, when the patient may cease to take the drug. Even then, however, its complete withdrawal may be followed by a return of the attacks.

The induction of BROMISM (*q.v.*), a condition produced by a long use of the drug, in which the patient is very stupid and languid, and ACNE (*q.v.*), are the chief obstacles to prolonged courses of bromine. The former disappears only on leaving off the drug, but the latter can, in most cases, be kept down by the addition of liq. arsenicalis \mathfrak{mij} -v.

When a bromide salt alone fails to check the fits it may be combined with tinct. belladonnæ (gr. v-xv), digitalis, especially if there be any cardiac lesion; extr. cannabis indicæ gr. $\frac{1}{2}$, or liq. morphinæ \mathfrak{m} v and upwards. Iron is said to do harm, but the writer has not found such to be the case, and it is certainly useful in anæmic subjects. Borax (gr. xv-xxx) three times a day has stopped the fits when bromide has failed (Gowers).

Counter-irritation, in the form of a blister, or a seton in the nape of the neck, has a marked effect in stopping the attacks in some cases. If there be a definite aura, beginning in the hand or foot, and treatment by drugs has no effect, it would be quite justifiable to trephine over the centre for the movements of this particular part, and remove, under antiseptic precautions, the part of the motor cortex stimulation of which gives rise to the initial spasm of the fit, as has been done by Horsley; but before having recourse to operative procedure, the patient should be put under a thorough course of iodide of potassium, even if there be no history of syphilis. A blister round the wrist, or a ligature suddenly applied, will often stop a fit beginning in the hand. Epileptics should be careful not to eat indigestible food, and the bowels should be kept well open, as neglect of these two precautions is very liable to bring on a fit. The mind should be well occupied, but not overtaxed.

C. E. BEEVOR.

EPISTAXIS (Bleeding from the Nose) may occur spontaneously or result from injury. When spontaneous, the possibility of the patient being the subject of the hæmorrhagic diathesis should be remembered.

Epistaxis not uncommonly occurs in young people about the age of puberty without any assignable cause, and it is still believed by some to occur vicariously for menstruation. In conditions asso-

ciated with much venous congestion, such as heart disease and cirrhosis of the liver, it is of frequent occurrence; also in diseases of the blood, as scurvy and purpura hæmorrhagica, when it may prove most formidable. Epistaxis is common in the early stages of enteric fever and in diphtheria, and is then sometimes of diagnostic value. It is often met with in whooping-cough, and may aid the diagnosis in a doubtful case.

Treatment.—Cold externally to the nose and forehead, and syringing the nostrils with iced water and tincture of the perchloride of iron, should be the first means tried, and, if they fail, the nares may be plugged. The old operation with Belloc's sound is now seldom performed, india-rubber bags, which are inserted empty and then filled with air or water, being more efficient and their use far less painful. Gallic acid in 10-grain doses, or spirits of turpentine in 15-minim doses, may be administered internally.

ERGOTISM.—Ergot is a fungoid growth which attacks the ear of rye and to a less extent wheat, barley, and oats. Meal prepared from rye so affected gives rise to a train of symptoms known as ergotism.

The *symptoms* at first are of an irritant character and include vomiting, purging, and colic; giddiness, headache, formication and itching of the skin, and sometimes affections of sight or hearing. Hæmaturia and jaundice also occur. There are, however, two chief effects, referable to the nervous and circulatory systems respectively, which persist after these symptoms have ceased. The first consists of severe cramps affecting chiefly the legs, and leading to tonic contraction and fixation of the affected muscles—the spasmodic form of the affection, which sometimes ends in general convulsions and death. The other, the gangrenous form, affects the extremities, the fingers, toes, nose, and ears, the usual sequence of events being coldness, pallor, discoloration, lividity, and gangrene of the part. Gradually a line of demarcation forms, and the necrosed part goes through all the stages of dry gangrene.

Treatment.—The removal of the cause is the first aim of treatment, and, whilst the irritant symptoms last, vomiting should be encouraged or induced. The spasmodic form might be combated by careful massage and the internal use of bromide of potassium or opiates. Gangrene if only threatening is best treated by the continuous current used

as in Raynaud's disease; at a later stage the treatment should be conducted in accordance with the rules of surgery.

ERYSIPELAS is an acute, specific, febrile disease, characterized by a special form of inflammatory skin eruption, which spreads by the lymphatics.

The term is unfortunately applied loosely to many other diseases accompanied by an erythematous blush (simple lymphangitis, various erythemata), and also to certain conditions of phlegmonous and diffuse cellular inflammation which may complicate erysipelas, but are due to a different virus—viz., the microbe of septicæmia.

The essential nature of erysipelas has been satisfactorily established by the researches of Koch and Fehleisen, who have isolated the specific streptococci and reproduced the disease in animals by inoculation. In appearance these streptococci closely resemble the pyogenic micrococci, but they grow and conduct themselves differently in various cultivating media, and their inoculation produces a different train of symptoms.

Much discussion has arisen as to whether the disease ought to be classed as "local" or "general." The point is, in the present state of our knowledge, undebatable, as erysipelas corresponds in most respects with other diseases depending upon the entrance into the economy of a specific micro-organism. As regards point of entrance, it must be considered "local." On the other hand, it corresponds with other "general" diseases in requiring a certain incubation period for the development of its manifestations and in their "general" or constitutional character.

Equally artificial is the distinction formerly recognized between "medical" and "surgical" erysipelas, the latter occurring in connection with traumatism, the former without obvious breach of surface. Trousseau pointed out—and subsequent experience has amply confirmed his observation—that "medical" erysipelas, occurring in the great majority of cases upon the face, has its point of origin in the mucous membranes of the nose, mouth, or eyes, where erosions can be demonstrated, and that it spreads thence to the skin. In the few remaining cases where actual breach of continuity cannot be demonstrated there is strong presumptive evidence of its occurrence.

Symptoms and Course.—During the period of incubation, which varies from

a few hours to three or four days, there is generally enlargement and tenderness of the lymphatic glands corresponding to the region about to be affected. The disease is ushered in either by a rigor or a sense of chilliness, with malaise, nausea, or vomiting, pains in the limbs, and a sudden rise of temperature to 103° or 104° F. Some burning or pricking sensation may attract attention to the skin, or the mucous membrane of the throat, mouth, or nose may be found to be sore, swollen, or congested. Soon, however, the rash spreads to the face.

Wherever the skin is involved it is swollen, infiltrated and pits on pressure; it is glazed, hot and of a vivid red colour, which becomes paler on pressure. The margin of the patch is always raised and well defined, either uniform or tongued "zigzag." It extends rapidly or slowly, its extension being modified by the natural lines of cleavage of the skin; in regions where the skin is tightly stretched or firmly bound down, its minimum is noted—e.g., the chin, occipital region, over Poupart's ligament and over joints. On the contrary, regions where the subcutaneous tissue is lax—e.g., the eyelids and scrotum—become enormously swollen.

As the disease progresses, increased local heat, pain and tension are complained of; fine vesication (often only perceptible with a magnifying glass) occurs over the surface of the patch, which becomes more and more brawny and of a deeper yellowish-red colour. Sometimes large blebs form by the coalescence of vesicles; they may burst and some scabbing ensue, but extensive suppuration is rare. In exceptional cases patches of the disease may show themselves at a distance from the original one, but, as a rule, the extension of the eruption is continuous. The temperature generally reaches its maximum in the first two or three days, and seldom exceeds 104° or 105°, but may reach 107° F.: it persists throughout the disease, with marked morning remissions, till the beginning of recovery, when it suddenly—or, more rarely, gradually—falls, and copious sweats often occur. The pulse, at first full and bounding, tends to become small, weak, frequent, irregular and dichrotic in severe cases. During the febrile period the urine is concentrated, high coloured, loaded with urates and uric acid; albumen is often present in considerable quantity, or even blood and casts. The tongue is at first moist and coated; afterwards it tends to become dry and brown. The bowels are generally

confined, but in severe cases diarrhœa is apt to set in, and must be regarded as a sign of evil omen, accompanied as it frequently is by collapse, hyperpyrexia, jactitation, muttering delirium, and other "typhoid" symptoms.

The duration of erysipelas is quite indefinite, and cannot be predicted in any given case; it usually, however, stops between the fifth and twenty-first day, when the rash, ceasing to spread, fades and subsides at its margin, and thence over the patch. Recrudescences and even distinct relapses are, however, of frequent occurrence. In this way the disease may last for six or eight weeks.

Marked desquamation always ensues, either branny or in large flakes, like those of *exfoliative dermatitis* or *scarlatina*.

When the scalp has been affected temporary baldness results, and in other regions chronic abscesses, situated deeply in the skin, or suppuration of lymphatic glands, may render recovery very tedious. Even without these sequelæ patients often remain a long time in a remarkably debilitated condition. Death rarely occurs, but it may result from high temperature, pneumonia pleurisy, peritonitis, or meningitis, or in cases where the neck is involved from extension to the larynx (*inflammatory œdema glottidis*).

The *prognosis* is grave in very young and very old persons, in those suffering from renal disease, in chronic alcoholics, and in women in the puerperal state.

The *differential diagnosis* is generally easy. From eczema and erythema it is distinguished by the rigors, fever and other constitutional symptoms, the character of the spreading margin, and the uniformity of the lesions. The frequent supervention of erysipelas on a patch of eczema must not be forgotten. In young persons acute necrosis with phlegmon may closely simulate erysipelas. As erysipelas presents certain variations and peculiarities according to its seat, a few words may be said with practical advantage as to its *local forms*.

Erysipelas of the face is the commonest local form; it may start from any catarrhal, erosive or ulcerative condition of the nasal, ocular, buccal or aural mucous membranes, whether primary or secondary to diseases of deeper parts (*e.g.*, necrosis of nasal or maxillary bones, diseases of teeth, otitis media with perforation). Œdematous swelling of the eyelids and consequent disfigurement are very marked, while the lips, nose and ears become thickened hard and brawny;

large vesicles and blebs often form. Extension from the eyelids to the cellular tissue of the orbits produces fixation of the eye-balls, often sloughing, and inflammation or atrophy of the optic nerves from pressure upon them, or, more rarely, thrombosis of the ophthalmic veins.

When the *scalp* is involved, headache is almost always a prominent symptom, with delirium and insomnia. If the temperature remain high, these cerebral symptoms become intensified, tremors, mania and coma often occurring. They are referable to hyperpyrexia, as post-mortem experience demonstrates the extreme rarity of meningitis, cerebral abscess, phlebitis, or other metastatic processes, to which they were formerly considered to be due.

Erysipelas of the genitals in males generally arises from a fistulous opening; the œdema and pain are often considerable, and gangrene of the parts over which the urine trickles is by no means infrequent. In females the vulva is often similarly affected from neglect of ordinary cleanliness.

Erysipelas of the trunk is of traumatic or surgical origin in the great preponderance of cases, but in infants it is apt to be set up round the umbilicus (*E. neonatorum*). Formerly the condition was considered as necessarily fatal, but this is far from being the case, although the prognosis is always grave. The disease spreads just like erysipelas in adults, but it has a special tendency to relapse, and is apt to cause sloughing or to leave a diffuse, doughy condition of the skin very like "œdema neonatorum." If a fatal result ensue, it is generally due to extension to the peritoneum or pleura, to pneumonia or diarrhœa. In young children erysipelas may also start from erosions of the anus or genitals, or from vaccination or circumcision wounds.

Recurrent erysipelas (*pseudo-erysipelas*) is a common and generally misunderstood disorder which, although not identical with true erysipelas, receives no notice elsewhere in this work, and is therefore briefly mentioned here. It occurs at any age, but with special frequency in children and in those who are strumous. In adult life, females appear to be more frequently affected than males. It attacks the face exclusively, especially the nose, upper lip and adjacent part of the cheeks; sometimes the lower lip, chin and forehead are also involved. There is some local rise of temperature, and an erythematous blush, with ill-defined margin and some swelling. No

constitutional symptoms of gravity are present. The attack generally lasts four or five days, occasionally longer. After subsidence of the erythema, the swelling persists, and it increases with every recurrence of the condition, which may take place at frequent intervals and without obvious cause. Finally, the parts, owing to blocking of lymphatics, become hypertrophied and firm to the touch, a physiognomy often described as characteristic of struma being thereby produced. The disease is never infectious or epidemic, and is most rebellious to treatment, which, indeed, seems to have no influence in averting recurrence. It may be mistaken in adults for acne rosacea or urticaria gigantea.

Ætiology and Pathology.—The immediate cause of true erysipelas is a specific streptococcus, but various conditions appear to favour its development or augment its virulence, and these may be considered as predisposing causes. Among them may be mentioned insanitary surroundings—*e.g.*, over-crowding, dirt, defective drainage and deficient ventilation. Recent improvements in sanitary science and its practical applications, and the adoption of various antiseptic precautions in surgical practice, have immensely reduced the frequency and mortality of erysipelas, which was formerly the scourge of hospitals. It still, however, exists, and occurs in small epidemics, which are specially frequent during the prevalence of east winds, or of cold, damp weather. In the presence of an epidemic, persons suffering from renal, cardiac or hepatic disease, or dropsy from whatever cause arising, are particularly liable to be attacked, as are chronic alcoholics, women in the puerperal state, and all those who are poorly fed and clothed.

The erythematous blush so common over œdematous limbs, especially after puncture with Southey's tubes, when unaccompanied by constitutional symptoms and unconnected with the existence of an epidemic, must not be considered as erysipelas: it is a simple lymphangitis.

The period of incubation, accompanied by enlargement of glands and preceding the appearance of the characteristic rash, constitutes a point of resemblance to the acute specific fevers, from which, on the other hand, erysipelas differs in the irregularity of its course and in its marked tendency to recur in persons once attacked. The latter point, however, is one of daily diminishing importance as regards the nosological position of ery-

sipelas, the opinion that "recurrent erysipelas" (pseudo-erysipelas, recurrent lymphangitis) is a separate disease receiving more and more support. Fehleisen even states that the micro-organisms are different.

When true erysipelas is once established it is locally infective, and spreads by the lymphatic spaces and vessels, which are found to be crammed with streptococci in chains, especially at and immediately outside the spreading margin of the disease; the cocci are never found in the blood-vessels. As the skin congestion disappears within a few hours after death, the other microscopical appearances are ill-defined and by no means characteristic. The subcutaneous tissue can generally be observed to be infiltrated with leucocytes, and its meshes are wide from serous infiltration.

Treatment.—The most various opinions prevail as to the efficacy of local measures, but there is no reasonable doubt that general treatment is of much greater importance.

A patient suffering from erysipelas ought to be at once isolated, especially in hospital practice, and the same precautions against the spread of the disease adopted as in the case of the acute specific fevers. The sick-room must be light, airy and cool. Absolute rest must be enjoined. The diet should be nutritious and easily digestible. Solids are to be interdicted; milk, beef-tea, chicken-broth, meat extracts and eggs are specially suitable.

Stimulants may be withheld, as a rule, in mild cases, but should be administered freely if the pulse become feeble or any of the previously described bad symptoms show themselves. During the febrile period brandy or whisky is to be preferred; if these cause sickness or increase thirst, champagne may be substituted. During convalescence, port wine, Burgundy and sound claret are preferable. For headache and insomnia, chloral and the bromides are to be preferred to opium and hyoscyamus. When diarrhoea is a prominent symptom, opium is, however, often the only drug which arrests it.

If the temperature be excessive and "head symptoms" prominent, no remedy is so valuable as the cold bath at 80° F. for fifteen or twenty minutes. This may be repeated at intervals of three or four hours if the temperature rise again to 104°.

At the beginning of an attack a purgative is generally serviceable.

No drug administered internally exerts any specific action upon erysipelas. Ringer recommends the tincture of aconite in the very earliest stage, in doses of $\frac{1}{2}$ to 1 minim every fifteen minutes for an hour or two until the skin is moist and the temperature falls, and at longer intervals afterwards. The treatment, however, is not unattended with danger, and its value is more than dubious. The tincture of the perchloride of iron, administered in large doses of 30 to 60 minims every four hours, is still regarded by many as exerting some specific influence on the disease. A considerable proportion of cases certainly seem to do well on this treatment, and the disagreeable effects which might be expected from such doses are seldom noted; but, on the other hand, in most cases the progress of the disease is in no wise arrested by it, and large doses of sulphate of quinine (gr. v-x every six hours) are certainly equally efficacious, and exert an additional beneficial influence upon temperature. Antipyrin, antifebrin, and other similar drugs may be used with the same object.

The large number and variety of *local applications* recommended perhaps afford the best evidence of their doubtful value. Painting the erysipelatous patch and the skin around it with collodion, solutions of nitrate of silver (gr. xv-3j ad 3j), tincture of iodine, or solutions of perchloride or persulphate of iron, with a view to arresting its extension, is a mode of treatment often adopted, but of very dubious utility. The injection of a 2 or 3 per cent. solution of carbolic acid at various points around the raised margin perhaps merits further trial. The protection from the air afforded by repeated dusting with flour or salicylated starch is certainly as efficacious and affords a pleasant sensation of coolness. Cold lead lotion may sometimes be used with benefit, but if there be much swelling and infiltration it is apt to cause or expedite gangrene; the same remark applies with increased force to the application of poultices. When gangrene appears imminent, minute linear incisions or scarifications seem occasionally to ward it off. J. J. PRINGLE.

ERYTHEMA is a term loosely applied to any inflammatory hyperæmia of the skin which disappears upon pressure. In this sense it may be due to any local irritant, and constitute the first stage of any dermatitis. The eruptions of scarlatina, measles, rôtheln, typhus, enteric fever and dengue are morphologically

erythemata, as are many MEDICINAL RASHES (*q.v.*), also the early rose rash of syphilis and those rashes which occasionally occur at the onset of variola and vaccinia, or in the course of diphtheria, tuberculosis, puerperal fever and septicæmia. A vivid, punctiform eruption (*E. scarlatiniforme*), attended with high temperature, often occurs after injuries or surgical operations, and is followed by desquamation. All the preceding may be classified together as "symptomatic" erythemata.

Idiopathic erythema occurs in two distinct forms—(1) *E. congestivum* (vel hyperæmicum), in which the morbid process is confined to mere congestion of the skin; (2) *E. exudativum*, in which infiltration of the skin is a marked feature.

(1) **Erythema Congestivum.**—(a) *E. roseola* consists in the development of congestive patches of a delicate rose colour, scarcely, if at all, raised above the level of the surrounding skin, varying in size from that of a split pea to a finger-nail, and either diffused over the whole surface of the body or in figured groups. The condition is common in young children in association with digestive derangements, and its onset may be accompanied by pyrexia and constitutional disturbance so considerable as to render its diagnosis from the exanthemata a matter of difficulty, in which case it is advisable to act as if the disease were contagious. Occasionally relapses occur. *Treatment* directed to the digestive disturbances is generally rapidly efficacious.

(β) *Chronic, symmetrical, congestive mottling of the skin* is a condition closely allied to the preceding. It affects young adults, especially females; it is very chronic, and may, in exceptional cases, cause considerable disfigurement. The extensor surfaces of the hands, wrists, arms and legs, sometimes also the cheeks, are mottled with dull bluish maculæ, due to the transudation of hæmoglobin. They do not disappear on pressure, and give the skin a marbled appearance, which is intensified by exposure to cold. No subjective symptoms are complained of. *Treatment* has no influence on the condition, which tends to slow, spontaneous recovery.

(2) **Erythema Exudativum** is a definite and interesting disorder, with two important subdivisions. It may be defined as an acute, or sub-acute, non-contagious, inflammatory disease, characterized by the development of symmetrically distributed, raised, erythematous patches, usually discrete, varying greatly

in form and size, accompanied by slight transudation of hæmoglobin or by copious hæmorrhage into the skin, occasionally terminating as vesicles or blebs, and specially liable to relapse. Constitutional symptoms of a rheumatic type are frequently present, but itching and pain are seldom prominent features.

Nothing more definite can be said of the essential nature of the morbid process than that it is probably a vaso-motor neurosis of central origin. The local changes consist in inflammatory dilatation of the vessels of the papillæ with exudation or hæmorrhage into the papillæ, the rete mucosum and more superficial layers of the skin, proportional in amount to the intensity of the process.

(a) *Erythema multiforme (vel polymorphe)* is common in young adults of either sex, especially in spring and autumn, and is very apt to relapse at the same seasons. Exposure to the sun or to sea air may cause a first attack or determine an attack in a person previously affected; the rheumatic habit decidedly predisposes to its occurrence, and it often appears in the course of acute rheumatism or gonorrhœa, and in connection with various disorders of the female generative organs.

A certain amount of malaise with gastric disturbance and fever may precede by some hours or days, or may usher in the appearance of the eruption, which almost invariably occurs on the backs of the hands and feet. The forearms and legs, the vicinity of painful joints—in rheumatic cases—are usually next involved. The trunk and face, even the mucous membrane of the mouth, throat, nostrils and eyes, are affected in severe cases. The lesions consist of flat or slightly convex papules, sharply defined, deep red or purplish in colour, varying in size from a pin's head to a fourpenny piece, or larger; on pressure, the red tint disappears, but a brownish stain remains. The neighbouring lymphatics and glands often inflame. Such is the commonest form—*E. papulatum*. If the papules coalesce to form larger plateaux, the condition is described as *E. tuberculatum*. Soon the centre of each papule or tubercle becomes sunken and bluish, slight desquamation occurs, and the process tends to recovery, the average duration of each papule being from eight to ten days. Abundant hæmorrhage may occur into the papules, bringing the condition into close affinity with that elsewhere described as *PELIO-SIS RHEUMATICA (q.v.)*.

Frequently, shrinking and desquamation occur in the centre of the papules, which continue to extend at the periphery by a raised margin. They form rings (*E. circinatum*, *E. annulare*), which may wander over the entire body, intersecting each other to form elaborate figures with crescentic edges (*E. gyrratum*). Occasionally new rings develop concentrically round older ones, and the forms thus produced, as well as the varieties of colour due to the different ages of the lesions, explain the designation, *E. iris*, applied to them. The occurrence of vesication is not uncommon, and represents the most aggravated type of the disease, *E. vesiculosum*, in which the inflammatory phenomena are so rapid and severe as to result in the transudation of serum in quantity sufficient to penetrate the rete mucosum and raise the epidermis in the form of small vesicles or even of large blebs. These are invariably surrounded by a bright red areola or raised base, and are intermingled with patches which do not vesicate. (Vesication affecting the periphery of patches of *E. iris* give rise to the condition erroneously termed "herpes" iris.)

If the amount of fluid be small it may be absorbed, and a disc of epidermis separate in the form of a scale from each subsiding vesicle. Even when large blebs are formed (*E. bullosum*), pustulation seldom occurs, but thick, yellow crusts result from their rupture, and excoriated patches are left which invariably heal without scarring.

A severe first attack seldom lasts longer than four weeks, but cases tend to become more severe with each recurrence. When the mucous membranes are affected, the patient's condition is a very pitiable one, and occasionally hæmaturia has been observed. Erythema vesiculosum cannot be separated by hard-and-fast lines from a group of diseases elsewhere considered under the name of *HYDROA (q.v.)*.

Differential Diagnosis.—*E. papulatum* may be mistaken for rûtheln, urticaria, papular eczema, or lichen; *E. iris* for tinea circinata; *E. vesiculosum* for variola, herpes zoster, scabies, or impetigo; *E. bullosum* for pemphigus or hydroa.

Treatment has little influence on the course of the disease. Special attention ought to be paid to the state of the bowels. Salicylic acid and salicylates are useful if rheumatic symptoms predominate; quinine is by some thought to be serviceable in preventing recur-

rences, and iodide of potassium (gr. xxx or more in twenty-four hours), has been found efficacious in arresting the disease. Locally, dusting powders, or lotions containing calamine or acetate of lead, are more generally applicable than ointments. In obstinate cases rest in bed ought to be enjoined.

(β) *Erythema nodosum* is occasionally associated with *E. multiforme* as a further development of *E. tuberculatum*, but generally exists as a distinct disease possessing features of its own sufficiently characteristic to warrant separate description. It chiefly occurs in children and weakly young women, and is often accompanied by symptoms not clinically distinguishable from those of sub-acute rheumatism, including insidious cardiac mischief. Multiple, raised, rosy patches, round or oval in the direction of the limb, from $\frac{1}{2}$ to 3 inches in diameter, suddenly develop along both tibiae, and often along the ulnar side of the forearms. They are exquisitely tender, tense and shining; they rarely vesicate, and although their appearance suggests imminent suppuration, they never suppurate. Finally, they become deep purple, subside to the general level of the skin, and undergo the changes in colour characteristic of bruises. The disease usually lasts two or three weeks, and does not tend to relapse; it may be confounded with bruises and syphilitic nodes.

Treatment consists in absolute rest in bed with protection from pressure, and in the administration of salicylates, quinine and iron, according to circumstances. The heart should be carefully watched. Painting with collodion relieves pain.

J. J. PRINGLE.

ESCHAROTICS are substances which destroy the tissues with which they come into contact; they resemble caustics in their action but are more powerful. The part that is destroyed is gradually separated from the healthy tissues by a zone of inflammation, and is called a slough. The chief escharotics are the actual and electric cautery, sulphuric and nitric acids, potash, lime, acid nitrate of mercury, chromic acid and the chlorides of zinc and antimony.

EXANTHEMA, an eruption. "The exanthemata" is the term used to include all the eruptive fevers. They are scarlet fever, measles, rōtheln, small-pox, chicken-pox, typhus fever, enteric fever, and erysipelas.

EXERCISE, by which in the present connection is to be understood only muscular exercise, has long been generally recognized as a valuable preservative of health; it is also a therapeutic agent of the first importance in certain diseases and cachectic states.

Exercise may be *general*, calling into action the greater number of the limb and trunk muscles; or *special*, being limited to certain muscles or groups of muscles.

General muscular exercise has a remarkable effect upon the principal functions of the body.

Respiration.—The number of respirations and the quantity of air inspired in a given time are increased; the amount of air inspired when walking at a very slow pace (two miles an hour) is doubled as compared with standing; when walking at four miles an hour it is trebled. The amount of oxygen absorbed and of carbonic acid (CO_2) eliminated are also increased; during a day of moderate physical exercise the oxidation of carbon is about 40 per cent. greater than on a day of rest.

Circulation.—The force and frequency of the heart's action are increased during exercise, and the arterial blood pressure rises. After cessation of exercise this rise in pressure continues for a short time, but the rapidity of the heart's action falls below the rate of rest. The normal healthy range is an increase of about twenty beats during and a decrease of ten after moderate exercise.

Skin.—The excretion of water, in the form of sweat, is greatly increased. The quantity so lost, instead of being about half or two-thirds of the amount of urinary water, is equal to and may be even double the total secretion from the kidneys. The loss of chlorides and (fatty) acids is also considerable. As the result of active exercise the total amount of water in the body, and especially of that in the blood, is decreased.

Urine.—The amount of urinary water and chlorides is decreased. The total nitrogenous constituents of the urine (urea, uric acid and creatin) are slightly decreased during the period of exercise and are increased during a succeeding period of rest, the increase during rest being probably slightly greater than the decrease during exercise, so that the eventual result is a small increase in the amount of nitrogenous loss.

Muscular System.—Regular constant exercise causes an increase in the density as well as in the bulk of muscle; there is an

actual storage of nitrogenous tissue, the additional amount of nitrogenous food ingested more than compensating for the loss above mentioned. Excessive exertion leads to muscular exhaustion, diminished irritability and finally to degeneration, so that an over-used muscle decreases in bulk.

Digestive System.—Exercise increases the appetite, especially for fat (rather than starchy foods) and for meat. Digestion is also more rapid, and the circulation through the liver is said to be better. The total weight of faeces is decreased. The amount of water ingested is increased, and a considerable proportion is stored up in the body, partially or wholly restoring that lost during exercise.

Nutrition.—An increased elimination of carbon, probably largely due to oxidation of fats in association with the changes necessary for muscular contraction, and a storage of nitrogen in the albuminous constituents of the muscles are the main results of constant, regular, moderate exercise. The increased elimination of water is only after a time balanced by absorption, and apparently the total amount may thus be permanently diminished.

The effects of general exercise on health will now be considered :—(1) In cases of disease due to (a) want of exercise, (b) excessive exercise, (c) exercise without ventilation; (2) In cases of disease curable or relieved by exercise.

(a) *Deficient exercise*, by lessening oxidation and diminishing the efficiency of the circulation, lowers metabolism; the muscular system wastes, while fat and water increase; the muscles become smaller, more flabby, paler, and the heart shares in these changes, so that subsequent exertion favours dilatation. Deficient exercise produces a lowering of pulmonary nutrition, which favours the onset of tuberculosis; it lessens appetite, enfeebles digestive power and favours chronic constipation.

(b) *Excessive exercise* produces more immediate results. The amount of exercise which ought to be taken cannot be precisely defined; the only rule is to stop when exercise of moderate severity has produced a distinct sense of fatigue. A labourer's daily work is about 300 foot-tons; a walk of 9 miles is an amount of work equal to 150 foot-tons; the amount of work done by a man weighing 11½ stone in walking 10 miles is nearly 190 foot-tons, while the amount done by a man weighing 15½ stone is nearly 260 foot-

tons, though the sense of fatigue in both may be the same.

Exercise may be excessive in amount or velocity; to row a mile in an eight-oared racing boat in seven minutes is an amount of work equal to only 18½ foot-tons, though an untrained man may easily exhaust himself by the effort. A due appreciation of this point is essential if exercise is to be safely used as a therapeutic agent.

Severe exercise produces very laborious respiration with occasional sighing; if still persevered in, hæmoptysis may occur. If exercise be too long continued, the slowing of the heart during rest may be attended by intermittence or replaced by palpitation. Over-exertion when frequently repeated produces cardiac hypertrophy, valvular disease, atheroma of vessels, and may even lead to rupture of the heart. Very great increase (120–140) in the rapidity of the pulse, or a disturbance of the rhythm of the heart, during exercise is an indication that it is excessive in amount or velocity.

The sense of fatigue is localized in some part of the nervous apparatus, and, if resisted, may be replaced by sleeplessness when sleep is desired. Tea favours this insomnia, and alcohol diminishes the excretion of pulmonary carbonic acid, so that both these beverages should be eschewed. The more rapidly work is done the more exhausting is it, and the greater is the strain on the muscular organs (heart and voluntary muscles).

(c) Since the amount of CO₂ expired is greatly increased by exercise, the air of a closed room is rapidly vitiated, and headache, loss of appetite and, in time, impaired general nutrition are produced in persons who take exercise in ill-ventilated workshops or gymnasia.

(2) The use of exercise in *chronic cardiac disease* has been reduced to a system by Professor Oertel. In cases of fatty heart with general obesity, in enlargement of the heart from gout and in chronic mitral disease, especially when the latter is associated with dropsy, renal disturbance, bronchial congestion or catarrh, the treatment is very effectual but should be combined with diminution in the amount of fluid and of fat and carbo-hydrates ingested. The patient is required to walk a certain distance up a path with a gentle rising gradient; the occurrence of dyspnoea on exertion, which may be at first very pronounced, is not considered a contra-indication for the treatment. The distance, and there-

fore also the height, are increased daily as the dyspnoea diminishes. Increased heart action thus caused favours the production or restoration of compensatory hypertrophy; the increased force and rapidity of respiration favours the circulation through the lungs and the emptying of the right side of the heart; and all these causes combine to accelerate the venous circulation.

It is said that the tension of the arterial walls relaxes, so that, though the arterial pressure is higher, the arteries are fuller, and that this only occurs in climbing, not in exercise on the flat.

Regulated exercise is of value in cases of *chronic bronchitis* occurring in obese indolent persons, and operates in the same way as in chronic heart disease. In phthisis in a quiescent state and limited to the apex of one lung, it acts by improving nutrition and favouring full expansion of the lung as well as the process of repair.

In *atonic dyspepsia* general exercise has a tonic effect, increasing appetite and digestive power; in dyspepsia associated with plethora, hepatic tenderness and constipation, it favours the hepatic circulation by unloading the right side of the heart and diminishes the tendency to constipation.

In certain *cachectic conditions* outdoor exercise is a powerful remedy—especially in scrofula, the “tubercular diathesis,” and rickets. It is also of great service in some forms of anæmia, but in chlorosis the amount of exercise taken should be very moderate; indeed, chlorotic patients often recover most rapidly when kept completely at rest for a time.

The exercise of *special groups of muscles* is of use in paralysis or paresis from disease, injury or disuse. (1) It may be voluntary where the patient retains some power over the muscles, and performs movements which bring the muscles into action; these movements may be performed against a certain resistance exercised by the hand of an attendant or by a machine (Ling system). (2) It may be involuntary, the muscles being stimulated by electricity (*see* MASSAGE).

DAWSON WILLIAMS.

EXOPHTHALMIC GOÏTRE
(Graves's Disease; Basedow's Disease).—A group of symptoms chiefly met with in women, of which palpitation, prominence of the eyes and enlargement of the thyroid are the most important, though the two latter cer-

tainly, and possibly the first, are not essential to the disease.

Symptoms.—The onset is usually gradual and insidious, but in a few instances the disease has suddenly appeared after great mental emotion. Palpitation is usually the first symptom noticed. The cardiac phenomena are certainly the most constant and the most important, and of these palpitation breathlessness and throbbing of the vessels in the neck are the chief outward signs; the heart's action is greatly increased in frequency, the pulse being rarely under 90, and often over 120; the cardiac impulse can be perceived over a large area, but there is no true heaving impulse. An anæmic murmur is frequently heard over the base of the heart, and, as the subjects of this disease are not seldom rheumatic, signs of organic disease of the heart will be found in a certain proportion of the cases. The marked pulsation in the carotids is associated with a dilatation readily perceptible, and it is probable that the arteries throughout the body are dilated, a belief which is supported by the frequent existence of epigastric pulsation. Pulsation of the central artery of the retina has been described, but it is by no means constant or even common. A well-marked *tâche cérébrale* is not uncommon.

The enlargement of the thyroid is often preceded or accompanied by a sense of fullness, constriction, or choking in the throat. The swelling is generally more marked on one side than the other, the right being most commonly the larger; the isthmus, also, is usually enlarged. The enlargement, though sometimes considerable, never approaches that seen in ordinary goitre; nor is the hardness so often found in the latter affection ever present. But, though the swelling is never very great or very hard, the trachea may be compressed even to a fatal degree. In many cases, over some part of the thyroid a thrill will be felt; it is often so fine that it can only be recognized by the lightest touch. In these cases, and often when there is no thrill, a loud blowing murmur may be heard over the thyroid on one or both sides.

Exophthalmos, when well marked, may always be known by the fact that, owing partly to the great protrusion of the eyes and partly to the retraction of the upper lid, a rim of sclerotic can be seen above and below the cornea, a condition never met with in health; when present in a high degree, it gives the patient a peculiar and savage aspect.

Sometimes the protrusion is so extreme that one or both eyes may become spontaneously dislocated. An eye to which this has once happened will be very liable to it again; and it is not a little remarkable that in these cases the vision is but rarely impaired. Another and more serious danger from the extreme proptosis is ulceration of the cornea, owing to the inability of the lids to close over the eye. This may result in complete loss of sight. Both eyes are not always protruded to the same degree; the right is the more likely to be the prominent eye, and in a few cases the right alone has been affected, the left being in its natural position. The pupils, if altered, will be slightly dilated.

Gräfe's lid-sign consists in the fact that the upper lid does not follow the downward movement of the eye with the perfect harmony seen in health. If the patient look down slowly it will be noticed that the upper lid, instead of following the movement in the usual way, does so in a hesitating and jerky manner, so that an unusual amount of the sclerotic above the cornea is disclosed during the process. Ultimately the lid comes to occupy its normal relative position to the globe, so that it is essential that the eye should be watched carefully whilst the patient is actually looking down, which should be done slowly, or the sign cannot be observed. It is not necessary that there should be any high degree of proptosis before this sign is present, as it has been found in the early stages of the disease before any protrusion has occurred; and, moreover, it is not present in proptosis from other causes. It is worth noting that cocaine, when dropped into the healthy eye, will produce exophthalmos and the lid-sign, and when used in a case of exophthalmos it intensifies the symptom.

Another sign is the apparent widening of the palpebral aperture, associated with, and probably dependent upon, retraction of the upper lid; it is known as Stellwag's sign, and is not always present; with it there has been noticed a diminished frequency of winking.

Besides these three cardinal phenomena, there are others, some of which are tolerably constant, and which may be of diagnostic value. It is almost the rule for these patients to suffer from profuse perspiration, often accompanied by a sense of heat; the sweating is general over the whole body, the skin being found moist even in those situations where it is habitually dry. This

symptom is sometimes the one of which most complaint is made. Paroxysmal attacks of diarrhoea, without any relation to errors in diet or other known cause, constitute another not uncommon feature. A very fine rhythmical tremor, affecting especially the hands, will be found in a very considerable number of cases; it may be so marked as to prevent the patient from writing, but very often it is so fine as to require careful search before it is recognized, especially as the patient is apt to try to conceal it. In females, amenorrhoea is almost constant, and sometimes the menses have never appeared at all. Attacks of sore throat, accompanied by slight redness of the fauces, are often met with, and some patients are liable to causeless seizures of moderate pyrexia, passing off in the course of a few days without leaving any evidence of their origin.

Patches of leucoderma or vitiligo on the neck, arms, legs or face are sometimes seen, and are due simply to absence of pigmentation; whilst with these, or apart from them, pigmented areas, like patches of chloasma, may be found, and in a few cases the co-existence of Addison's disease has been noticed. Urticaria has also been known to occur. The presence of albumen in the urine has been occasionally observed apart from any kidney disease. Emaciation is usually a prominent feature, and the subjects are generally anæmic, whilst nervousness, irritability, change of temper, loss of appetite and digestive disturbances are amongst the chief premonitory symptoms, and persist after the affection is well established.

In a few instances the disease has run a rapid course, and death has occurred in six weeks, being due presumably to the emaciation and exhaustion. As a general rule the course is very slow, and in a large number of cases more or less complete recovery ultimately occurs. Marked emaciation, profuse sweating and diarrhoea, and uncontrollable vomiting are symptoms which indicate that the case will probably terminate fatally. Epistaxis is amongst the later phenomena, but it is not necessarily of bad augury; the eyes may recede and the thyroid diminish in size before death occurs. In a small percentage of cases the patient becomes temporarily or permanently insane.

Diagnosis.—A well-marked case could hardly be mistaken for any other condition, nor could there be much hesitation when palpitation and a rapid pulse coincided with either exophthalmos or

enlargement of the thyroid. If the cardiac phenomena, sweating, tremors and nervousness be present, a diagnosis of the disease would be justified; but in the absence of any cardiac phenomena it may be doubtful, although, if the view of the pathology of the affection expressed below be correct, it is quite conceivable that the heart might escape.

Pathology.—The exact pathology is still a matter of speculation; the cervical sympathetic so frequently accused of being the cause of the disease has often been found healthy. Vascular lesions were found in one instance in the medulla on a level with the nuclei of the eighth pair of nerves, but it is at least possible that they were the result rather than the cause of the disease. The protrusion of the eyes is associated with an increased development of fat in the back of the orbit, but in all probability it is mainly due to the increased vascularity of this region. The enlargement of the thyroid is due to an increased development of interstitial tissue as a result of long-continued and excessive vascularity. The heart may be dilated, and may show signs of organic disease. The theory which would attribute the symptoms to an affection of the inferior cervical sympathetic ganglion does not fulfil all the conditions as regards the three cardinal phenomena, and may safely be set aside.

In endeavouring to frame a satisfactory idea of the disease as a whole, the sweating, diarrhoea, and fever already referred to must be borne in mind. The presence of a vaso-motor centre in the medulla oblongata is an established fact, and it is probable that in its immediate neighbourhood there is a centre regulating the sweat glands, and there is good reason to believe that there is also close by a centre for regulating the heat of the body. A lesion of the medulla which caused paralysis of these centres would be capable of giving rise to all the phenomena of the disease except those referable to the heart, and, inasmuch as the centre for the pneumogastric nerve is quite close, it is a fair assumption that it too might be paralysed, and the frequency of the heart's action be thus explained. The complications sometimes met with would render this view more probable, as diabetes, glycosuria, ophthalmoplegia externa, and bilateral paralysis of the associated movements of the eyes have all been known to occur as complications, and it is a fact that they may be caused by a lesion of the medulla. This view is further supported

by the fact that, in those cases where the exophthalmos and thyroid enlargement are most marked on the right side, the cardiac phenomena are also well marked, it being well known that the right pneumogastric is the chief, if not the sole, inhibitor of the heart's action. It is probable, therefore, that functional disturbance of that portion of the medulla in which these centres are situated is the actual cause of the disease.

Ætiology.—The disease is much more common in women, but is occasionally met with in men, when it presents the same features. It may appear from the time of puberty up to middle life, but is commonest in young women from seventeen to twenty-five. From the fact that the disease is met with in men, and that it is comparatively rare even in women, it may be inferred that amenorrhoea or other menstrual disturbances are not to be reckoned as causes, but rather as effects of the disease. Fear, mental shock, anxiety and worry are amongst the exciting causes in a large proportion of the cases, whilst inherited neurotic tendencies are also frequently present. In some instances the disease has appeared to run in families. In a certain proportion of cases rheumatism will be found amongst the antecedents.

Treatment.—Quiet and freedom from excitement are essential features in the treatment of this disorder; occasionally it will be necessary to confine the patient to bed. Fresh air and a nourishing diet without stimulants are next in importance. Digitalis alone or in combination with iron, iron by itself, belladonna, iodine, arsenic and bromide of potassium, all have their supporters, and have all seemed to do good; at present it is not possible to give any precise directions for the employment of any one of these drugs in preference to any other, but it is certain that they are used with very different degrees of success in different individuals. The continuous current has in the hands of some appeared to exert a beneficial effect; the poles should be applied behind and a little below the angle of the jaw on each side, or the negative pole to the nape of the neck and the positive pole to the thyroid or eyes. When the proptosis is extreme, ice should be applied to the forehead and to the nape of the neck, and the lids may be stitched together to protect the cornea from ulceration. Ice may also be applied to the thyroid when its enlargement is very great; and, when there is a dangerous pressure on the trachea the

isthmus may be divided, after which the thyroid will probably shrink; but if the symptoms are not relieved, tracheotomy should be performed.

JOHN ABERCROMBIE.

EXPECTORANTS promote the discharge of the secretions from the air passages. They increase the quantity of the sputum, or make its expulsion easier, either by altering its chemical constitution or by increasing the expulsive power.

They may be classified, according to their influence over the circulation, into *stimulant* and *depressant* expectorants. To the former class belong squill, senega, benzoic acid, benzoate of ammonia, the balsams of Tolu and Peru, tar, and the vapour of chlorine, iodine, ammonia, creasote and carbolic acid. In the depressant group are ipecacuanha, antimony, iodide of potassium, and the alkaline chlorides. Carbonate of ammonium, strychnine and belladonna increase the respiratory movements or stimulate the respiratory centre.

EXPECTORATION.—This term is commonly applied both to the act of expectoration and to the products thereby discharged from the air passages.

In health the secretion of the respiratory mucous membrane is removed by the action of its ciliated epithelium, but when the amount of this fluid is increased, ciliary movement is no longer sufficient, cough is excited in a reflex manner and the secretions are expectorated. Cough consists in a sudden forcible expiration, combined with a momentary closure of the glottis, the effect of which is to discharge the contents of the trachea and larynx into the mouth, and to propel the secretion in the bronchi towards the trachea.

The excessive products of the pharyngeal mucous membrane are got rid of by the process of "hawking."

The sputum or matter expectorated may be derived from any part of the respiratory passages, from the pharynx to the pulmonary alveoli. Owing to the wide distribution of mucous glands throughout this tract, the expectoration always contains mucin in varying quantities. The sputum is described as mucous, muco-purulent or purulent according as it is transparent, semi-opaque or resembles the contents of an abscess. Mucous and muco-purulent sputa are generally thick and tenacious, as distinguished from the purulent variety, which is less viscid. At times

mucous expectoration may be thin and watery. Sputum from the larynx and trachea and from the larger and medium sized bronchi is frothy, whereas that derived from the bronchioles and pulmonary vesicles is always more solid, and contains fewer air bubbles.

The secretion of the pharynx is seldom much aerated, and is particularly tough, owing to evaporation being favoured by the continuous and forcible air current to which the pharynx is exposed.

Mucous secretion consists mainly of water with small quantities of mucin and saline matter. In bronchitis and in all conditions where the sputa are purulent, a small amount of albumin escapes from the blood-vessels and is discharged in the expectoration.

Muco-purulent and purulent sputa often present a nummular appearance, which has been regarded by some writers as pathognomonic of the presence of cavities in the lung; but this is a mistake, for the same appearances may be presented by the expectoration of chronic bronchitis without excavation or bronchial dilatation. The presence of carbon in any quantity gives the secretions a grey or blackish colour.

Fibrinous casts of the bronchial tubes are found in the sputum of plastic or croupous bronchitis.

Blood may be expectorated with the sputum in the shape of streaks or clots, or it may be intimately mixed with the secretions. In the latter case the sputum has a rusty, brick-dust, prune-juice or florid colour, according to circumstances which cannot be considered here. Pure blood may be coughed up when hæmorrhage is profuse and sudden. Various adventitious matters may be voided with the expectoration—hydatid cysts, diphtheritic membrane, portions of new growths of the larynx, pulmonary calculi, carbon in different forms, dust of all kinds (iron, siliceous, &c.), vegetable and animal fibres, fragments of necrotic lung tissue, crystalloid products of chemical change and numerous varieties of micro-organisms. Many of these foreign substances can be recognized with the naked eye; others require the use of the microscope for their detection. In certain morbid states of the bronchi (bronchiectasis, putrid bronchitis), in pulmonary gangrene and in certain cases of abscess and excavation of the lung, putrefactive decomposition of the secretions occurs with the formation of volatile fatty acids (butyric, valeri-

anic. &c.), also of leucin, tyrosin, sulphuretted hydrogen and other products, which impart a terribly offensive odour to the sputum and breath.

Microscopical Examination.—Much information may be obtained by examining the sputum like any other liquid—*e.g.*, urine—without any special preparation. A small quantity of the sputum is transferred to an object-glass, and a cover-glass is gently pressed on the specimen so as to spread it out in a thin layer.

FIG. 1.



Curschmann's Spirals of different Form and Size. $\times 90$.

Mucous sputum consists of a transparent amorphous mucin basis, in which a few epithelial cells of various sizes and shapes are generally recognizable. These cells are squamous, spheroidal, columnar, or columnar-ciliated according to the part from which they are derived. When the expectoration is muco-purulent or purulent, pus-corpuscles, granular matter and frequently small oil globules are discovered. Pigmentary granules, mostly

consisting of carbon, are very commonly present in the sputum of persons living in towns or a smoky atmosphere. Fine needles of fatty acids, and crystals of cholesterin, leucin and tyrosin may be detected when putrefactive processes are at work. Blood-corpuscles are met with in various conditions.

Curschmann's Spirals.—The small thick pellets expectorated towards the close of an asthmatic paroxysm are often found to contain spiral threads of mucin arranged like a corkscrew. At times a central thread can be seen within the spiral coil. These objects, which can often be recognized with the naked eye, are believed to represent casts of the bronchioles, and Curschmann considers that they indicate the existence of an exudative bronchiolitis, which, according to his view, is the lesion on which asthma depends. Subsequent investigation has shown that the spirals are sometimes present in cases of simple bronchitis and pneumonia.

Charcot-Leyden Crystals.—Pointed octahedral crystals, insoluble in ether and alcohol, but soluble in acids and alkalis, were found by Leyden in the sputum in cases of asthma, and were believed by him to have a causal relation to the attack. The crystals appear to be analogous to Charcot's crystals, which are seen in the spermatie fluid and elsewhere. They are said to consist of a combination of phosphoric acid with a complex organic base. Charcot-Leyden crystals are not confined to asthmatic sputum, and therefore possess no special diagnostic value.

Lung Tissue.—If the small, opaque, shreddy particles frequently seen in phthisical sputum be teased out with needles in a drop of water, the characteristic curled, branching, elastic fibres can often be detected. At times, where excavation is proceeding rapidly, the elastic tissue presents traces of an alveolar arrangement, but more often scattered individual fibres are observed. A little practice is needed to recognize lung tissue with certainty, as adventitious threads of cotton and other materials are easily mistaken for elastic fibres. Lung tissue may also be discovered by boiling the sputum with an equal volume of a solution of caustic soda (20 grains to the ounce) for a few minutes, and allowing the fluid to stand in a tall conical glass for twenty-four hours, when the fragments of elastic tissue sink to the bottom and can be detected in the sediment. This latter method, recommended by Fenwick, is more suit-

able for general purposes. The discovery of elastic tissue in the expectoration is a certain sign of the existence of destructive disease of the lung, whether ulcerative or gangrenous, but it does not enable us to distinguish the nature of the disease more precisely.

FIG. 2

Lung Tissue. $\times 90$.

Phthisis (tubercular), being by far the commonest of all the destructive pulmonary affections, is usually indicated when elastic fibres are found in the sputum, but at the same time the presence of gangrene or of ulceration depending upon cirrhosis or bronchiectasis cannot be excluded. However, since Ehrlich's researches simplified the detection in the sputum of Koch's tubercle bacillus, a decisive test of the existence of pulmonary tuberculosis has been brought within the reach of every clinical observer.

Small portions of laryngeal new growths are occasionally coughed up, and may be examined in the fresh state, or they may be embedded in celloidin and cut into fine sections in the usual way. The investigation of the expectoration for "cancer cells" seldom yields trustworthy results.

Micro-organisms.—Microbes of various descriptions may be discovered in the sputum—micrococci, diplococci, streptococci, bacilli and different forms of fungi. At present there are only two varieties—the tubercle bacillus and the actinomycetes or ray fungus—which possess undisputed clinical significance.

Tubercle Bacillus.—This microbe may be detected in the following manner.—The sputum is poured into a flat glass dish and examined against a dark background. A small quantity of the thickest and most opaque part is removed with a clean platinum loop or scalpel, and transferred to a freshly cleaned cover-glass; a second

cover-glass is then placed on the first, and the two glasses are gently pressed together so as to spread out the sputum in as thin and even a layer as possible. The cover-slips are then separated and allowed to dry, after which they are picked up with forceps and passed three times through a Bunsen flame to coagulate the albumin. The preparations are then ready for staining.

The following reagents are required to complete the process:—

1. A solution of fuchsin, either (a) Ehrlich's solution—saturated alcoholic solution of fuchsin 11 c.c.; saturated watery solution of aniline oil 100 c.c. (this solution is apt to undergo decomposition, and should be freshly prepared every fortnight); or (b) Ziehl's solution—saturated alcoholic solution of fuchsin 10 c.c.; 5 per cent. watery solution of carbolic acid 100 c.c. (this solution is much more stable, and may be preserved for months).

2. A concentrated watery solution of methylene blue.

3. A solution of nitric acid—commercial nitric acid 1 part, water 2 parts.

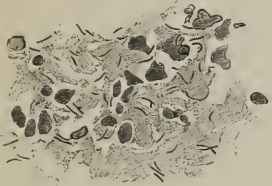
Method of Staining.—The staining fluids must be filtered each time they are used. The cover-glass is now placed with the sputum downwards in a watch-glass or small glass capsule containing the fuchsin solution, and the staining fluid is heated on a sand bath or over a spirit-lamp till it begins to boil. The flame is then removed, and the preparation is allowed to remain about five minutes longer in the hot solution. The cover-slip is next removed with forceps, and immersed for two or three seconds in the nitric acid solution, when the red colour of the fuchsin changes to a brownish grey. The glass is then washed for five or six seconds in a gentle stream of water flowing from a tap, when the red colour reappears. Finally, the preparation is stained in some of the methylene blue solution in the cold for a few minutes, washed again in water, and allowed to dry. The cover-glass is then mounted in Canada balsam dissolved in benzol or xylol, and is ready for examination.

When the staining is satisfactory and the bacilli are numerous, the microbes can be recognized with a magnifying power of from 200 to 300; but when they are scarce, and in all doubtful cases, a sub-stage condenser and a $\frac{1}{2}$ oil immersion lens are indispensable.

The tubercle bacilli by this method of staining appear as delicate rods of a red or crimson colour, the pus corpuscles and

other micro-organisms being stained blue. The staining of the tubercle bacillus may either be uniform or the organism may seem to be indistinctly beaded, an appearance which has been attributed to the presence of spores. Morphological differences of this sort have no diagnostic or prognostic importance.

FIG. 3.



Tubercle Bacilli, Pus Corpuscles, and
Masses of Mucin. $\times 550$.

The discovery of bacilli with these staining reactions in the sputum is a positive proof of tuberculosis of some part of the respiratory tract. Tubercular ulceration of the larynx, pharynx, or trachea may furnish some of the microbes, but the great mass of the bacilli come from the lungs.

When the results of examination are negative, mistakes are very liable to be made, and until the sputum has been repeatedly examined we are not warranted in asserting that tuberculosis is absent. The sputum expelled on waking in the morning is most likely to contain the tubercle bacilli, as it represents the collection of some hours. Moreover, the morning sputum is voided without hawking, and is less likely to consist of pharyngeal secretion.

The number of bacilli found in the sputum is not necessarily a measure of the activity or extent of the disease, it is mainly a question of discharge. When tubercle bacilli are numerous, the existence of pulmonary excavation is almost certain.

The examination of the sputum, so valuable as a method of diagnosis, has, unfortunately, not proved of much service for purposes of prognosis.

Actinomyces.—These organisms have been detected in the sputum in actinomycosis of the lung. The characteristic clubs can easily be recognized with an oil immersion lens without the application of any stain, if the small yellow specks or granules be first sought out with the naked eye or with a low power. For full information on this subject the reader

is referred to the article on ACTINOMYCOSIS.

Micro-organisms in Pneumonia.—The diplococcus pneumoniae and Friedlander's capsule coccus are often found in the sputum of pneumonic patients, the former more frequently than the latter, but their significance is as yet uncertain.

PERCY KIDD.

EXTRA-UTERINE GESTATION means pregnancy elsewhere than in the body of the uterus.

Its causes may be broadly expressed as follows:—Conditions which prevent the ovum from getting to the uterus, but do not prevent the spermatozoa from getting to the ovum. Among these are inflammation of the Fallopian tube, leading to shedding of the ciliated epithelium, which should both aid the movement of the ovum to the uterus and prevent the spermatozoa from travelling along the tube; tumours, or adhesions, partially blocking the tube or rendering it tortuous; emotional disturbances or traumatic influences acting about the time of conception, and perhaps causing some spasmodic contraction of the tube. It frequently occurs after a long period of sterility, being a result of conditions which often altogether prevent normal pregnancy. Extra-uterine gestation is more frequent in multiparae, and occurs with disproportionate frequency in twin pregnancies.

Anatomy.—The most common seat is in the Fallopian tube. Some even maintain that all cases are in the beginning tubal; but the gestation has been found, by dissection in a few cases examined by competent persons, to be in the ovary, or in a tubo-ovarian cyst. Cases of abdominal pregnancy are met with in which no history pointing to previous rupture of a tubal cyst can be obtained, and therefore it is inferred that the pregnancy was primarily abdominal. But the condition of parts is much altered by the pregnancy, and perhaps for this reason no case of abdominal pregnancy has yet been dissected in which it could be demonstrated that previous rupture of the tube had not taken place. The pregnancy may be in that part of the tube which traverses the uterine wall. This is called tubo-uterine or interstitial pregnancy.

Course.—In tubal pregnancy no decidua exists in the tube. As the pregnancy goes on, the chorionic villi become inserted into the mucous membrane of the tube; the growing ovum gradually

expands the tube. Hypertrophy of its muscular fibres takes place analogous to that of the uterus in pregnancy, but less in degree. From the expansion of the tube, the muscular bundles become stretched and separated. Usually between the fifth and thirteenth week the tube ruptures, about the eighth week being the usual period. The ordinary mechanism of rupture is, that slight separation of some chorionic villi takes place, causing hæmorrhage between the ovum and the containing tube, and the distension caused by this effusion of blood bursts the tube.

Several events may now happen. (1) The blood, poured out between the chorion and the enclosing tube, may extensively separate the chorion (as in abortion) before rupture takes place. The separation may be so considerable as to destroy the life of the embryo. In this case, after rupture has taken place, the effused blood, the fœtus and its membranes will be absorbed, and natural cure result. (2) The chorionic villi may not be separated to such an extent as to destroy the vitality of the embryo. In this case the first hæmorrhage, which is commonly slight, may be followed by renewed attacks of hæmorrhage, one of which may at length kill the patient. (3) The rupture may have taken place on the side of the tube which is between the folds of the broad ligament. In this case the blood will be extravasated into the cellular tissue of the broad ligament, and death from hæmorrhage is not so likely to happen. If the fœtus be not killed by the separation of chorionic vessels, it may go on developing under the peritoneum, raising the membrane as it grows; and in this situation it may reach full term. This is called sub-peritoneo-pelvic gestation. (4) Both fœtus and mother may survive even though the rupture take place into the peritoneal cavity, and the pregnancy go on to term. This is called secondary abdominal pregnancy. In such a case the chorionic villi, as they grow and become aggregated together to form the placenta, may attach themselves to almost any part of the peritoneum. The placenta has been found attached to the stomach, small intestine, large intestine, mesentery, omentum, anterior or posterior abdominal wall, uterus, and broad ligament; and it has been seen within the tube, and even within the uterus, while the fœtus was outside. Wherever the placenta is attached, it produces a great

increase in the size and number of the vessels of the part.

While the fœtus is growing outside it, the uterus undergoes a development the same in kind, but less in degree, as that which occurs in uterine pregnancy. It becomes enlarged, its walls thickened, its cavity lengthened, and a decidua thicker and larger than the menstrual decidua is formed within it. At some period in the course of pregnancy—sometimes early, sometimes not until near the end—this decidua is expelled.

When full term is reached, the child dies, and the liquor amnii is usually absorbed. (1) The child may be retained in the abdomen unchanged for an indefinite period, or (2), without detriment to the mother's health, it may become converted into adipocere (rare). (3) The membranes may undergo calcareous degeneration so that the fœtus becomes contained in a stony case, and there may be in time some deposit of calcareous matter in the superficial parts of the fœtus itself. This change is called the formation of a "lithopædion." It is very slow in progress. (4) The fœtus may become shrivelled and mummified. (5) It may suppurate. The soft parts are disintegrated, the bones separated from one another, and at a variable period (on the average about six months, and generally within two years) after the death of the child the abscess bursts. It opens most often into the large intestine; next often externally through the abdominal walls; least often into the bladder or vagina. Through this opening, if the patient survive, first the pus and then the fœtal bones, are gradually eliminated. This is a very tedious process, lasting, if unassisted by art, two or three years, or even longer.

Symptoms, Diagnosis, and Treatment.—From the clinical point of view, we must divide the disease into six stages.

1. Before Rupture.—The reported cases are too few in number to allow us to generalize as to the symptoms before rupture. In almost every case in which the nature of the disease has been shown by operation or by autopsy, rupture had taken place. The diagnosis has never yet been made and confirmed before rupture. A few cases have been cured before rupture by operation, but in them it was not possible to make any closer diagnosis than that there was some disease of the Fallopian tube. Increasing experience may possibly point out criteria by which to distinguish tubal pregnancy from other tube diseases; and

if the diagnosis were made, the proper *treatment* would undoubtedly be to remove the diseased tube by abdominal section.

2. **After Rupture**, but before the foetal heart can be heard, the case may come under notice at various stages: (a) after one or more slight hæmorrhages have occurred, causing symptoms sufficient to attract attention, but not making the patient seriously ill; (b) after profuse internal bleeding has occurred, reducing the patient to a state of collapse; (c) after the patient has recovered from the collapse caused by a severe internal hæmorrhage.

(a) This is commonly the earliest stage at which the condition is diagnosed. There are five indications from which, taken together, the diagnosis may be made with a close approach to certainty. These are (1) a history of the symptoms of early pregnancy—the patient thinks herself pregnant; (2) these symptoms having lasted a month or two, the patient begins to suffer from attacks of severe, paroxysmal abdominal pain; (3) about the same time she begins to have irregular hæmorrhages from the uterus, and with one of these hæmorrhages there may be the passage of a deciduous membrane (a most important sign); (4) there is a swelling behind and on one side of the uterus; (5) there is slight enlargement of the uterus. The severe pains probably depend upon distension of the tube, and the sudden distension of the tube is probably caused by slight hæmorrhage into it. In cases operated on after the diagnosis had been made, the tumour has been found to consist of the dilated tube surrounded by blood clot.

In deciding as to *treatment*, we have to consider the alternatives of expectancy and abdominal section. Galvanism has been recommended, but it practically amounts to expectancy. Puncture by the vagina, and subsequent injection into the sac, or the use of galvanism and cutting into the sac, have also been employed. They bring with them the risk of abdominal section, without the certainty of cure. If the assemblage of symptoms be complete, the best treatment will be abdominal section without delay. If the diagnosis be not clear, but only probable, or possible, the relations and size of the tumour should be defined as exactly as possible, and the case carefully watched to determine if the tumour be increasing in size. If it increase in size, abdominal section should be performed as soon as the fact of increase is certain.

(b) In collapse following profuse hæmorrhage, if the patient be seen before she is so prostrate as to have no chance of recovery, the abdomen should be opened at once, the effused blood let out, the diseased tube removed, and the abdomen washed out and drained.

(c) After the patient has recovered from the collapse caused by a severe hæmorrhage (which is the stage at which most of the hitherto published successful operations for extra-uterine gestation have been performed), it is to be remembered that the hæmorrhage may recur, and that peritonitis may follow, although it seldom does. From these risks the patient is saved by a successful operation. On the other hand, a large hæmorrhage generally, though not always, is accompanied by stoppage of the pregnancy; and if this happen, the patient will recover if she survive the shock of the hæmorrhage. The probability of recovery after operation greatly depends upon the condition of the patient at the time of operating.

The decision as to the course best for the patient is here more difficult than in the before-mentioned circumstances. It must be settled by these considerations:—The less the hæmorrhage, the better the patient's condition, the less likely it is that the pregnancy has come to an end, and the greater is the prospect of recovery from the operation. The greater the hæmorrhage, the more exhausted the patient, the less is the prospect of recovery from operation and the greater the chance that the pregnancy will have come to end. Should symptoms of internal hæmorrhage be followed by those of peritonitis, the abdomen should be opened without delay, the effusion let out and the diseased part removed.

3. **After Symptoms of Rupture have passed off, the Foetal Heart being still audible.**—In this stage of the pregnancy it is not common for very urgent symptoms to arise. The patient may suffer from discomfort caused by the enlargement of the abdomen, or by the foetal movements, or from symptoms of pressure on bladder, bowel, vein, &c., but seldom from any more serious troubles. The diagnosis of pregnancy is easy, for the foetal heart can be heard. The only difficulty is to ascertain that the pregnancy is not uterine. This is best done by careful bimanual examination under an anæsthetic, by which method it is possible to distinguish the uterus from the foetal tumour. It can be felt through the abdominal wall if in front of the sac;

through the rectum if it be behind. Diagnosis may be difficult, for the uterus may be fixed, elongated and spread out in front of the tumour so as to be hardly distinguishable from it. At this stage decision is difficult. On the one hand, the danger to the mother is not greatly increased by waiting till full term, and by operating at term the child is given a prospect of life, and the danger of an operation some time after the child is dead is less than that of an operation in the second half of pregnancy. Operative interference may therefore at this period be postponed, unless demanded by urgent symptoms, and treatment limited to the relief of symptoms by palliative measures. On the other hand, the earlier the pregnancy the less is the danger from hæmorrhage during operation. The experience of the operator must be allowed to weigh in the decision. The earlier the pregnancy, the clearer is the indication for operation; the nearer term, for postponement.

4. At Term.—This is marked by the onset of *spurious labour*. This curious phenomenon is characterized by paroxysmal abdominal pains, which to the patient seem like those of labour, and by a discharge of blood and mucus from the vagina, like the "show" which is an early symptom of normal labour. Dilatation of the cervix has been observed to occur in spurious labour, followed by its contraction when the pains have passed off. This, with other considerations, makes it probable that the spurious labour pains are real uterine contractions. The spurious labour may last from a few hours to two or three weeks. When it has passed off there is a lochial discharge and a secretion of milk from the breasts. The mammary activity may last from a few days to many months or even years.

The ideal *treatment* of extra-uterine pregnancy is the delivery of a living mature child by abdominal section at term. But, up to the present time, four-fifths of the cases so treated have ended in the death of the mother, and the majority of the children have died. Further, a large proportion of extra-uterine children born alive have been deformed. The ideal, therefore, has not yet been reached in practice; and, unless urgent symptoms are present, we shall give our patients the best chance of recovery by letting spurious labour pass off without more than palliative treatment.

5. After Full Term.—At term the child dies, and then, as a rule (not without ex-

ception), the liquor amnii is re-absorbed. The circulation through the placenta then ceases, blood is extravasated into it, and the vascular connections between it and the maternal organism become less and less. The length of time which it takes for the placental circulation on the mother's side to cease varies widely in different cases, so that no rule can yet be laid down.

The *diagnosis* of an extra-uterine gestation after the child is dead will usually be assisted by the history. But if the clinical history be deficient or misleading, the diagnosis may be extremely difficult; indeed, it may be impossible, without an exploratory incision, to distinguish an extra-uterine fœtus from a solid, or partly solid, ovarian or uterine tumour. If there be urgent symptoms, operation is indicated, whatever the nature of the tumour. If the patient be not suffering in health, some guide for treatment will be gained by carefully measuring to see whether the tumour grow or not.

The child may remain for months or years in one of the conditions mentioned above (unchanged, mummified, calcified or converted into adipocere) without causing any disturbance of the mother's health. The placenta becomes gradually absorbed. If this be the course of the case, no treatment is required. If suppuration take place, the commencement of this change will be indicated by hectic fever. The experience of operators prior to the introduction into surgery of antiseptics showed that the best prospect for the patient was to postpone interference as long as possible, so that the operation necessary should be of no greater difficulty or risk than the opening of a large abscess. But this course involves much exhaustion of the patient by hectic fever before the matter is let out, the danger of exhaustion from discharge after operation, and also the danger of the abscess opening into an unfavourable place. The better course is to open the abdomen and remove the child as soon as febrile symptoms begin. It is well to wait for symptoms, because (1) an operation may not be needed at all; (2) the longer we wait, the less will be the vascularity of the placental site, and the more likely will it be that both fœtus and placenta can be removed.

6. After Suppuration and Disintegration of the Child have taken place.—The most favourable place at which the suppurated cyst may burst is the abdominal wall, and next to that the

vagina, because here the opening can most easily be got at. The nature of the abscess, if there be no previous history, will be clear, from the discharge of foetal bones. The treatment is to enlarge the opening as much as is safe, and to remove the foetal bones.

Pregnancy may take place in an imperfectly developed cornu of a bicorned uterus, the connection between the gestation cavity and the cervix uteri being reduced to a mere band of fibro-muscular tissue.

Such cases are difficult to distinguish from tubal gestation even on the post-mortem table. The nature of the case is shown by the insertion of the round ligament, which in tubal gestation is of course internal to the sac; whereas, if the sac be a uterine horn, the round ligament will be attached to its outer aspect. Clinically, as to symptoms, course, and treatment, these cases differ in no essential respect from tubal pregnancy.

G. E. HERMAN.

F

FACIAL NERVE, Paralysis of the (Bell's Paralysis).—Paralysis of the facial or seventh nerve may be produced (1) by lesions at any point in the motor tract—i.e., in the cortex (where the movements of the face are represented in the corona radiata, internal capsule, or crus), at the point of decussation of the facial motor fibres in the pons, or by a lesion in the nucleus of the facial nerve of the opposite side; (2) by disease of the facial nucleus or of the nerve on its way to the facial muscles.

Facial paralysis arising from any of the first-mentioned lesions is considered under HEMIPLEGIA, of which it is a common symptom. The results of the latter class of lesions only are here described.

The facial nerve is liable to be affected in three different places—in the face, from cold, the result of sitting in a draught or riding in a carriage with the window down, or it may be due to an injury, or the pressure of a tumour; in the temporal bone, secondary to disease of the middle ear or due to rheumatic or syphilitic neuritis; and inside the skull, where it may be compressed or destroyed by a tumour, or involved in the lesions resulting from an acute or chronic meningitis.

The nucleus of the facial nerve is liable to be destroyed by tumours in the substance of the pons, and by hæmorrhage or softening.

Symptoms.—The duration of the period of onset of facial paralysis may vary from a few hours to a day or two, or the patient may wake in the morning and find that his face is paralysed. The condition of the face is the same whether the nerve or its nucleus be affected. All the muscles supplied by the nerve are paralysed, and consequently, when the affected side is at rest, the corner of

the mouth is lower and the forehead smoother. When movement is attempted it is seen that the brow cannot be wrinkled or elevated, the eyelids cannot be closed, and, in showing the teeth, the middle line of the upper lip is drawn over to the normal side; whistling and blowing up the cheeks are impossible. At the same time the buccinator is paralysed and the food collects between the cheek and the jaws, and the nostril cannot be opened, as in sniffing. There is no response from the muscles of the affected side to involuntary stimuli, and the patient smiles and laughs on one side only of his face.

It was formerly thought that the soft palate was paralysed in certain cases of facial paralysis, but this is certainly erroneous, as the levator palati is supplied by the accessory nerve to the vagus, and not by the facial (see *Proc. Roy. Soc.*, vol. xlv., a paper by Mr. Horsley and the writer). The only way to test the integrity of the palate muscles is to make the patient phonate, the fact that the soft palate does not when at rest hang straight being no sign of paralysis.

Taste on the same side is lost if the lesion involve the part of the facial nerve between the origin of the large petrosal and the chorda tympani nerves.

The electric reactions are very important, and assist the prognosis of the case. The facial nerve loses its reactions to both faradic and galvanic currents very rapidly; they may have completely disappeared at the end of one or two weeks. The faradic reaction of the muscles corresponds to that of the nerve. The galvanic reaction of the muscles is diminished in the first week; there is then a gradually increasing excitability, which attains its maximum in from three to four weeks, and after that declines. At the same time the contractions of the

muscles are slower and more deliberate, and the serial changes of the reaction of degeneration are observed (*see ELECTRICITY*). The chief point to be noticed is that the muscles react sooner to the positive than to the negative pole.

These changes are due to degeneration taking place in the nerve and muscle, the latter being cut off from its nerve nucleus. As a rule, the reactions of the nerve to both currents and the faradic reaction of the muscles gradually return, reappearing in favourable cases in a few weeks. In cases in which recovery is late the reaction may not reappear until from four to six months, whilst in cases presenting no improvement in motor power the reactions remain permanently absent, and after a time the galvanic reaction of the muscles is also lost.

Recovery of power over the paralysed muscles usually takes place a little before the electric reactions are obtained.

In those cases in which the electric reactions return in a few weeks, the first parts to regain power are the muscles of the forehead and the orbicularis palpebrarum, and it may be several weeks later before the muscles about the mouth improve.

In some cases the facial nerve is so little damaged that there is no change in the electric reactions, or only a diminished reaction to the faradic current. Here, although all the muscles of the face may be completely paralysed, recovery of power is rapid and complete. In old cases, with no improvement, a contraction takes place in the fibrous tissue of the muscles, drawing the mouth towards the paralysed side, and it is only on voluntary movement that one can then tell which is the side affected.

The *diagnosis* of this form of facial paralysis has to be made from that caused by disease of the cortex or internal capsule of the opposite side. In the latter the upper part of the face—*i.e.*, the forehead and eye—is not usually so much affected, though it does not always completely escape; there is no alteration in the electric reactions, and some paralysis of the limbs of the same side is usually present. Another point is that, although the patient cannot voluntarily retract the paralysed angle of the mouth, it is at once thrown into action by emotional stimuli, such as smiling; this is never the case in paralysis of the facial nucleus or nerve.

When the lesion is in the substance of the pons, the sixth nerve of the same side is usually involved, and there is paralysis

of the arm and leg of the opposite side, producing what is called "crossed paralysis." Tumours or meningitis outside the medulla usually cause paralysis of other cranial nerves, especially the auditory. Failing these symptoms, and especially if there be a history of injury or ear disease, the lesion is most probably in the temporal bone.

The *prognosis* in the most common form—*i.e.*, the rheumatic—is favourable as regards recovery according to the way in which the muscles react to the electric currents, but recovery may be delayed for from six to twelve months. The prognosis is good in early syphilitic cases. When the paralysis is due to caries of the petrous bone the prognosis is much more unfavourable, and, unless the lesion be syphilitic, facial paralysis, due to tumours in or outside the medulla, is part of a necessarily fatal disease.

Treatment.—In "rheumatic" cases, hot fomentations should be applied to the face, with glycerin and belladonna liniment. After the inflammatory condition has subsided, blisters should be applied behind the ear and the constant current employed, but the use of the latter is to be avoided in the early stages. The positive pole should be placed behind the ear of the affected side, and the negative passed gently over the muscles, only the weakest current which will produce a contraction being employed. Even should the muscles react to the faradic current, it is best to employ the constant current, as the use of a faradic current of the strength necessary to produce contraction of the muscles is often exceedingly painful. The constant current should be persevered with so long as there is any reaction in the muscles, but when this is lost it is useless to continue electrical treatment, as the case is then incurable; but so long as the muscles react to the constant current, there is a possibility of recovery taking place. Faradization of the opposite healthy muscles in late contracture of the paralysed muscles has been advised, but it is not to be recommended. The muscles should also be gently rubbed, and this should especially be done in cases of late contraction of the paralysed muscles. Disease of the ear should always be looked for, and treated if present.

In cases due to syphilis, iodide of potassium in increasing doses should be given, and electrical treatment employed. Where the disease is due to non-syphilitic tumours little can be done, as such cases

are as a rule beyond the reach of surgical operation.

Double facial paralysis occurs but rarely; it is produced most often by syphilis, diphtheria and meningitis, or by tumours about the pons, and in some cases from cold. The affection does not call for special description. C. E. BEEVOR.

FACIAL SPASM.—By this term is meant a curious clonic contraction of the muscles supplied by the facial nerve, involving either one-half of the face or only the muscles around the eye, and then termed “blepharospasm.”

The spasm is most commonly reflex to some irritation or disease of the fifth nerve of the same side, and may be produced by carious teeth or cold to the face, and it is believed to be also caused occasionally by the presence of intestinal worms. A tender spot can often be found in the course of a branch of the fifth nerve—*e.g.*, the supra-orbital—pressure upon which stops the spasm. The contractions occur at about the rate at which a person in health blinks, but at times they altogether cease. They are often induced by going out into the cold air. In some cases occurring in children and in girls about puberty the cause of their occurrence cannot be discovered, and the movement is allied to what is called histrionic spasm, a condition in which local involuntary twitchings of the face, acquired in childhood, persist during adult life, and are increased by emotional causes.

The *prognosis* is favourable when any source of local irritation capable of removal can be found, but in the other cases it is very difficult to relieve the affection.

The *treatment* consists in removing any source of irritation, such as carious teeth; and if a painful spot over the fifth nerve exist, a blister there will often stop the movement. In some cases the operation of stretching the facial nerve has proved beneficial. Tonics, such as iron and quinine in full doses, and morphine applied locally and by hypodermic injection, are useful. Galvanism without interruption of the current, the positive pole being applied behind the ear and the negative on the face, the strength of the current being gradually increased, sometimes arrests the spasm.

C. E. BEEVOR.

FACIES HIPPOCRATICA—the aspect of the face seen after prolonged wasting disease, or as the result of star-

vation, or before impending death. The original description by Hippocrates is as follows:—“A sharp nose, hollow eyes, collapsed temples; the ears cold and contracted, and their lobes turned out; the skin about the forehead being rough, distended, and parched; the colour of the whole face being green, black, livid or lead coloured.”

FALLOPIAN TUBES, Diseases of.—Like other mucous membranes, that of the Fallopian tubes is subject to **Inflammation**. It may be primary, due to morbid sexual excitement, to alcoholic excess, to chill, especially during menstruation; or to injury, as from the use of irritating intra-uterine injections. It may be infective, as from gonorrhœa, or from the extension of puerperal endometritis; secondary to disease of the uterus, such as endometritis, cancer, fibroids, retroversion or retroflexion; or result from general blood changes, as typhus, scarlatina, cholera, or phosphorus poisoning; or it may be due to venous congestion, as from heart, lung or liver disease. It is sometimes attributed to perimetritis and hæmatocele; but where these diseases occur with tubal disease, the latter is generally, if not always, the primary change. It may be due to new growths in the tube itself, tubercle being the most common.

The affection may not go beyond slight catarrh, manifested by swelling and injection of the mucous membrane and slight enlargement of the tube by increased secretion, appearances which are commonly seen at autopsies. Inflammation of the tube being a frequent cause of peri-oophoritis and perimetritis, is consequently often found in association with adhesions, especially around its abdominal end. Catarrh of the tube is not only common on the post-mortem table, but is probably as common during life, ending most frequently in recovery. When chronic, it leads to destruction of the ciliated epithelium of the tube, and so to sterility or extra-uterine gestation.

When the abdominal end of the tube has become occluded, its secretion is retained; the fluid may be merely serous or mucous, the condition being then termed **Hydrosalpinx**, or hydrops tubæ. Tubes so distended may reach such a size as to cause them to be mistaken for ovarian cysts; they have been found containing more than a gallon of fluid, but such a condition is rare. The usual appearance is that of sausage or club-shaped swellings, constricted at two

or three points, 2 to 4 inches in length and 1 to 2 inches in diameter. When small, the distension affects only the outer two-thirds or thereabouts of the tube. The disease is often bilateral. The enlarged tubes usually sink backwards into the recto-uterine pouch. After fluid has accumulated in the tube in consequence of closure of its openings, it is possible for the uterine opening to again become permeable, and thus a sudden discharge of watery fluid, which has come from the tube, may be noticed by the patient. This has been called *hydrops tubæ profluens*. It is rare, and probably most of the cases described under this name by old authors were misinterpreted; but there is no doubt that such cases do occur. The fluid may also be discharged into the peritoneal cavity either by rupture or by re-establishment of its abdominal opening, and, if the contents are simply serous, the fluid may be absorbed and the patient get well.

The tube may contain pus. This is called *Pyosalpinx*. The pus may be recent and thin, or it may be old, thick and inspissated. It is often accompanied by much thickening of the wall of the tube, and by adhesions of the tube to neighbouring parts. The mucous membrane of the tube may be ulcerated, and the ulceration may perforate the tube, letting out the pus into the peritoneal cavity; or the wall of the tube may be in places thinned, and may burst at a thinned spot. The pus may also escape through the abdominal end of the tube into the peritoneum. In whatever way the pus gets into the abdominal cavity, the result is acute and, if not treated, rapidly fatal, peritonitis. The pus may also be discharged by perforation into other parts, as the rectum, the vagina, or externally. It may also, like serous accumulations, escape through the natural opening into the uterus.

The tube may contain blood. This is called *Hæmatosalpinx*. Bleeding from the mucous membrane of the tube is not uncommon; indeed, there is reason to think that it is an important part of normal menstruation, and that slight hæmorrhages, not of sufficient extent to cause marked symptoms, occur in many pathological conditions. It is only when the tube is closed and the blood retained that it becomes a source of trouble. It may occur as a result of menstrual retention (see *AMENORRHOEA*). It is believed that even when there is not absolute closure of the genital canal,

but only slight and temporary hindrance to the escape of menstrual or other blood from the uterus, some of it may regurgitate into the Fallopian tubes. As a result of extra-uterine gestation, it is one of the most important conditions of the tube.

Signs and Symptoms.—During life, dilatation of the Fallopian tube can be made out by bimanual examination, but it cannot be decided whether the tube contains watery fluid, pus, or blood. Stretching of the tube causes pain, and in each of these conditions there is, as a rule, persistent pelvic pain, worse at the menstrual period, and aggravated by sexual intercourse. Menstruation is usually too copious, and the flow may be too frequent; but this symptom is not constant enough to be relied upon.

On physical examination, a tender lump is felt on one or both sides of, and behind, the uterus; and, on careful bimanual examination, the swelling is found to taper off into a cord which runs to the upper angle of the uterus. This sign applies equally to small ovarian cysts; but they are, as a rule, neither painful nor tender. But when a small ovarian cyst has suppurated, the symptoms and signs are practically indistinguishable from those caused by a dilated Fallopian tube, except that they are less influenced by treatment. If, as often happens, the pelvic organs are matted together by adhesions, it may be impossible to ascertain with certainty the relations of the swelling. In some cases, after masses of tissue enclosing suppurating cavities have been removed from the body by operation, the parts are so matted together by adhesions, and so torn in the process of removal, that it is impossible, even on dissection, to say whether the cavities are dilated tubes or not; and, in such, the only diagnosis that can be made is that there is disease of the uterine appendages.

Treatment.—The majority of cases of inflammation of the tubes will get well with rest in bed, light diet without alcohol, laxatives, counter-irritation to the skin of the abdomen, and avoidance of intra-uterine treatment. Their course is chronic, often lasting many weeks, and they are prone to relapse. If this treatment, though persevered in, fail to do good, and the patient's suffering be such as to prevent her from performing her domestic and social duties, the diseased parts may be removed by abdominal section. If, in a patient suffering from chronic disease of the uterine appendages, acute peritonitis

come on, abdominal section should be performed at once, and the diseased parts, which will almost certainly be the cause of the peritonitis, removed. In deciding as to operation in chronic disease of the uterine appendages, the chief indication is the presence of a definite swelling which can be grasped bimanually. Where there is not a distinct tumour, and the disease is inferred from induration, fixity of the parts, and persistent pain, it is very likely that the pain is neuralgic, and the disease little more than thickening of the parts, from organized inflammatory effusion; and, in such cases, removal of the appendages, even if possible, is not likely to be followed by very great improvement.

In the hands of the most skilful operators the average mortality after removal of diseased and adherent uterine appendages is probably not less than 10 per cent.

The abdomen is opened in the middle line about half-way between the pubes and umbilicus by an incision from 2 to 3 inches in length. The peritoneal sac having been laid open and the uterine appendages identified by tracing them outwards from the fundus uteri, the adhesions are broken down and parts drawn up through the wound; then, the tube and ovary being held outside, the broad ligament is transfixed as near the uterus as possible and tied, and the part beyond the ligature cut off. If the stump do not bleed, the ligature is cut short and the stump dropped in. If there be much oozing from the torn adhesions, or if pus or other fluid have escaped into the abdomen, the pelvic cavity should be well washed out with plenty of warm water at a temperature such as the hand can comfortably bear. If washing with hot water fail to check hæmorrhage, the pelvis should be packed with hot sponges so as to press firmly on the bleeding point, and pressure kept up for some few minutes. If some point bleeds freely in spite of hot water and pressure, it may be touched with perchloride of iron. If the oozing be only slight, a Keith's drainage-tube should be put in and the wound closed round it, and it may confidently be expected that the hæmorrhage will cease. Any kind of clean dressing may then be applied. The treatment of the case is in other respects just as in other cases of abdominal section.

Tubercle of the Fallopian tube and Cancer of the Fallopian tube are rarely met with. Both conditions usually occur with similar disease elsewhere. Neither

has ever been diagnosed as a disease existing by itself.

Dilatation of the Fallopian tube at its uterine end is sometimes seen. Little or nothing is known of its ætiology. Its importance is, that fluids injected into the uterus may flow into the peritoneum through a dilated tube, and that the uterine sound may travel up a dilated tube, and so give an erroneous idea of the length of the uterus.

G. E. HERMAN.

FAVUS (Tinea Favosa; Honey-comb Ringworm) is a very chronic disease of the skin, due to the presence of a vegetable parasite, characterized clinically by the formation of cupped, sulphur-yellow plates in the epidermis, affecting usually hairy parts, especially the scalp, but sometimes spreading to hairless parts of the body.

The disease is very common in Poland and France. In Scotland it is still of not infrequent occurrence, but in England it is very rare, and is met with only among the most squalid of the lower classes, especially the Irish, and among the Polish Jews of the East-end of London, who usually import it. It is decidedly contagious, although much less so than ringworm, and frequently affects several members of the same family at the same time. It is also frequently contracted from dogs and cats, which, in their turn, derive it most probably from rabbits and mice.

Favus generally begins in childhood, and its duration is indefinite. It may last till advanced age, as long as hairs remain to provide a favourable nidus for the growth of its fungus. It begins in the scalp as a pinkish circular spot, which soon becomes covered with fine scurf, and sometimes exhibits faint vesication round the periphery. After about ten or fourteen days a minute yellow point may be seen round a hair, but in the thickness of the epidermis, and covered by some of its layers. As this increases in size to constitute the characteristic "plate" (*scutellum* or *scutulum*) its edge becomes considerably raised, but its attachment to the hair, where the epidermis is fixed down, persists, causing the typical central depression. This cupped plate usually shows some concentric marking, and increases until it attains the size of a split pea or fourpenny-piece, but is seldom larger. Although its central portion may become pale and whitish, its periphery retains the vivid yellow

colour; finally, it often ruptures the cuticle, which forms a loose, fringe-like appendage round its margin. As these plates grow in depth their convex undersurfaces form deep depressions in the rete, from which they can be easily "shelled" out with any blunt instrument, leaving a pit, the surface of which is usually smooth and moist, but sometimes bleeding and ulcerated. If of recent formation, these pits soon fill up again, but, if old, they are permanent, as atrophy of the true skin, and atrophic scarring, result from the long-continued pressure. The circular plates, when numerous, exert mutual pressure upon each other, and thus become hexagonal or polyhedral; and when a very large surface becomes involved they lose all form, and the scalp becomes covered with a mass of yellow crusts, intermingled with scabs, blood crusts and moist inflammatory products exhaling a peculiarly offensive "mousey" odour, almost, if not quite, pathognomonic of the disease. The fungus early penetrates the hair near the bulb, passing between the root-sheaths to ramify in the hair shaft, and causing it to become lustreless and friable, although it does not become broken, stumpy and twisted as in *tinea tonsurans*. Soon the hair is easily detached and falls off spontaneously, leaving large, bald areas, many of which are permanent. The co-existence of patchy baldness, atrophic scarring, and groups of yellow plates constitutes a typical picture, and the association with myriads of pediculi—which are probably responsible for the greater part of the inflammatory and impetiginous changes present—is almost invariable. Itching is usually moderate, although sometimes severe. On the body favus shows itself as ringed patches, very like *tinea circinata*, but seldom attaining large size. In the centre typical scutellum-formation generally occurs, and vesication often takes place at the periphery. Unlike favus on the scalp, it is easily curable, the fungus being confined to surface epidermis, and the follicles of lanugo hairs being shallow. The nails are sometimes also affected. The yellow fungus matter may show itself beneath the free margin of the nail, or may form beneath the nail, causing it to become opaque and thickened, with a tendency to splitting both transversely and longitudinally.

For the detection of the fungus of "achorion Schönleini" the crusts or hairs must be soaked in acetic acid or liquor potassæ, and the addition of

some ether is useful. The mycelium is somewhat similar to that of ringworm, but is not so fine; it is not so uniform in outline, but is often markedly moniliform or jointed. It breaks up into circular or polyhedral spores, larger than those of ringworm and coarsely nucleated.

Differential diagnosis must be established from ordinary impetigo of the scalp from severe seborrhœa, *tinea tonsurans* and psoriasis. Possibly the scars left might be confounded with those of lupus erythematosus, some syphiloderma, or even acne varioliformis. Microscopic investigation and careful attention to the preceding description will obviate all chance of error.

Treatment must be vigorously carried out for a prolonged period to effect cure when the scalp is affected, but removal of crusts from the body followed by any mild anti-parasitic application soon cures lesions there. The hair must be cut short with scissors; all scabs must be removed by poultices, or by rags soaked in oil, and the head covered with a flannel cap. Thereafter vigorous washing with hot water and soft soap must be carried out previous to the operation of epilation, which may be accomplished either by using broad forceps, which seize several hairs at a time, or fine forceps, which remove a single hair. After the daily epilation, inunction of some parasiticide is necessary, resorcin (3j ad 3j) and salicylic acid (3ss ad 3j) being probably the most potent and successful. When the nails are affected, their avulsion is necessary, and even then cure is very slow.

J. J. PRINGLE.

FEBRICULA.—A term loosely applied to a number of morbid states, of which fever is the prominent and predominant feature. It might be described as a morbid genus without essential attributes, consisting mainly of aberrant varieties of other determined species. The febrile disorders to which the term is applicable may be roughly grouped under the following heads:—

(1) Abortive or incomplete forms of the specific continued fevers—typhus, typhoid and relapsing fever. Cases of irregular type may occur at any time, but are more often met with during the epidemic prevalence of these diseases.

(2) Cases of scarlet fever, modified variola and more rarely measles and erysipelas, in which the eruption is either absent or unnoticed.

(3) In rare instances, anomalous forms of intermittent fever.

(4) Fevers due to the effects of some localized inflammation, in which the local signs are transient, ill-developed, or beyond the reach of observation. Cases of this sort occur in connection with lymphadenitis, tonsillitis, stomatitis and acute catarrhal affections of the alimentary and respiratory tracts.

(5) The group of fevers due to disorders of digestion, with absorption of pyrogenic substances through the gastric or intestinal mucous membranes.

(6) Cases in which the development of primary or secondary syphilis is attended by considerable febrile reaction, of which the source may not be easily discoverable.

(7) Fevers depending on some disturbance or exhaustion of the nervous system, as the consequence of exposure to excessive heat, or of some peripheral nerve irritation.

Febricula is very common among children, less frequent among young adults, and somewhat rare after thirty.

Symptoms and Course.—The only symptom common to the whole group is pyrexia, and in not a few cases it constitutes the whole disease. This applies especially to young children, in whom a sudden rise of several degrees in the body temperature may constitute the only appreciable deviation from health. The invasion is generally sudden, but may be gradual. The temperature may reach 104° F. or even higher, especially in children. In adults the onset is sometimes attended by chilliness or distinct rigors. Nausea and headache are also common initial symptoms. In children there is often sickness; more rarely the disorder is ushered in by a convulsion. The febrile blush is often well marked, and must be distinguished from the eruption of scarlatina, with which it may be confounded. During the acme of the fever, which generally lasts from twelve to forty-eight hours, more rarely for three or even four days, the ordinary concomitants or symptoms of fever are present in varying number and degree. The pulse and respirations are always increased in frequency. In children the *alæ nasi* are easily set in action, and rhonchi and crackling râles may occur in the lungs, disappearing when the temperature falls. Herpes labialis is sometimes met with. Restlessness and disturbed sleep are usually present, and there may be slight delirium. Constipation is the rule, with slightly furred

or red and irritable tongue. There is usually disinclination for food, and in children thirst is nearly always excessive. The urine is scanty and high-coloured and deposits lithates on cooling.

In some cases the symptoms of gastrointestinal derangement predominate; in others the brunt of the affection falls on the respiratory tract, whilst in a third group the disturbances of the sensorium overshadow all other symptoms. In these rarer cases of cerebral type, which are almost peculiar to children, headache, repeated vomiting, intolerance of light and irritability or stupor, with or without delirium, are the chief symptoms.

The temperature generally falls by crisis, and is attended by an immediate remission in the symptoms. Convalescence is always rapid.

Diagnosis.—This rests chiefly on the exclusion of other acute fevers. Typhoid fever, pneumonia, meningitis and scarlet fever are the diseases from which the diagnosis is most difficult in the early stages. The occurrence of a sharp attack of fever in a previously healthy child is in favour of febricula. It must, however, be borne in mind that what at the outset appears to be simple fever may develop into some severe and even highly infectious disease. And, further, some forms of febricula appear to be infectious, as, for instance, the so-called feverish cold. A knowledge of these facts should enjoin both care and prudence in the treatment of these affections.

The *prognosis* is always favourable.

Treatment.—Rest in bed, with simple diet, for a day or two, will suffice in most cases. Cooling drinks and diaphoretics are pleasant and harmless. Constipation should always be relieved by appropriate means. Castor oil and calomel are amongst the most efficient remedies in the treatment of these affections. Antipyretic treatment is not called for.

WILLIAM PASTEUR.

FEVER (Pyrexia) may be defined as a certain disorder of the body-heat usually characterized by a rise of temperature.

In most of the diseases presenting the symptom of pyrexia, there are other symptoms, which are now regarded as either (1) secondary to the exciting cause of the primary disease, or (2) secondary to the symptom of pyrexia.

In the latter group have been placed—quickening of pulse and breathing, nervous disturbances, such as delirium or

coma, digestive disturbances, such as loss of appetite and sickness, disturbance of the salivary, sudorific, renal and other secretions, wasting and degeneration of the muscles and of some other tissues. But though these symptoms enter into the ordinary clinical conception of fever, they are not essential to it, the only essential feature being the disorder of the body-heat.

In *health* the temperature of the body, though not perfectly *constant*, is nearly so. Taken in the mouth its daily range for an adult is from about 97.6° F. to 99.6° F. But within this range the temperature is *stable*; in other words, causes external or internal which tend to raise or to lower it beyond the normal at the same time call into play physiological agencies which counteract any such effect.

We have to consider the nature of these agencies. To maintain a stable temperature different from that of the surrounding medium, the body must possess (1) means of producing heat (thermogenesis); (2) means of easting off or discharging heat (thermolysis); and (3) means of automatically adjusting the balance of (1) and (2), whatever their separate variations may be (thermotaxis).

Thermogenesis.—The chief source of heat within the body is the chemical change or oxidative metabolism continually going on in the muscles, and to a much less degree in the glands and alimentary tract during digestion. The muscles may be regarded as “the thermogenic tissues *par excellence*.” The metabolism subserving heat production in the muscles is under nervous control, like that which results in contraction or motion. The thermogenic nerves are closely associated with the motor nerves, but they are probably not identical with them. Gaskell has shown, moreover, that in the case of the involuntary muscles and of the heart the motor nerves are accompanied by others whose function is inhibitory. These cause the contracted muscle to relax, and at the same time set up chemical changes in it which are not oxidative or destructive, but restorative or reconstructive. The motor nerves are, therefore, described as catabolic, the inhibitory nerves as anabolic.

It is assumed that the thermal nerves are also twofold, the catabolic inducing oxidation and the development of heat, the anabolic inducing reconstruction and the inhibition of heat production. Various points in the track of the thermal nerves through the spinal cord and brain have

been discovered, the most important being about the inner and anterior aspect of the corpus striatum (the so-called “heat centres”).

Thermolysis.—The chief avenues by which heat is discharged from the body are the skin and the lungs, about 80 per cent. normally escaping by the skin and less than 20 per cent. by the lungs. These avenues are each controlled by a twofold nervous mechanism. The thermolysis of the skin depends chiefly on the flow of blood through its vessels, whose calibre is increased by the vaso-constrictor (or catabolic) nerves and diminished by the vaso-dilators (or anabolic) nerves, each set having appropriate “centres” in the cord and medulla oblongata. The discharge of heat by the lungs, more important perhaps in the lower animals than in man, depends on the rapidity and depth of the respirations, and these are likewise known to be controlled by a twofold nervous apparatus in the central nervous system. Thermolysis, therefore, like thermogenesis, may be regarded as subject to nervous control, which is on the one hand excitator or catabolic, on the other inhibitory or anabolic.

Thermotaxis.—As the mechanisms of heat production and heat loss are thus essentially nervous, that which adjusts their balance in health must also be nervous, and, like other adjusting and co-ordinating mechanisms, must be higher than either—higher in complexity of organization, and higher and later in the scale of evolution. In it, to use Hughlings Jackson's expression, the lower and more automatic mechanisms must be “represented.” As it is more complex and less automatic, it is likely to be more easily disordered, and less definitely localized in the central nervous system than the thermogenic and thermolytic mechanisms. On this account we as yet know little of its anatomical seat, and of its normal mode of working. The like is true, and for a like reason, of the higher motor, sensory and mental nervous mechanisms.

Temperature.—The temperature of the body at any moment is not, *per se*, a measure either of heat production or of heat loss. So long as the heat discharged is equal to that produced, the temperature remains constant, whether its level be high or low. If heat loss lag behind heat production, the temperature will steadily rise until heat loss becomes equal to and overpasses heat production, when the temperature will fall again. Thus a low temperature may co-exist

with excessive thermogenesis if thermolysis be adequate, and a high temperature may co-exist with diminished thermogenesis if thermolysis be inadequate. Thus the mere fact that in pyrexia the temperature is usually raised does not prove either that thermogenesis is increased or that thermolysis is diminished.

Thermal Ataxia.—If the thermotaxic mechanism be disordered or weakened without any serious disturbance of the other two thermal functions, these latter may vary independently, and, as there is nothing to bring them constantly to a balance, the body temperature undergoes large and irregular fluctuations. Of this nature are probably the “paradoxical” or “hysterical” temperatures sometimes recorded, which may for a short time rise to 110° F. or more, and that without grave or permanent lesion. The rise of temperature is not evidence of pyrexia, and its fall is not defervescence; the condition is one of inco-ordination, and may be fairly described as thermal ataxia.

Pyrexia.—When the thermotaxic mechanism is disordered or weakened, and thermogenesis is at the same time morbidly and continuously increased, we have the condition of fever or pyrexia. Experiment and observation have alike shown that the high temperature which usually characterizes fever is due, not to continuously diminished discharge, but to greatly increased production of heat. Thermolysis is, indeed, proceeding at an abnormally active rate, and though at first it may lag behind, it at length overtakes thermogenesis. Thus the temperature does not rise continuously, but after a while fluctuates, at a high level indeed, but within moderate limits, for days together. At the same time, thermotaxis being enfeebled, the high temperature of pyrexia is essentially *unstable*, and may be raised or lowered by disturbing causes which in health would be quite ineffective. The increased thermogenesis occurs chiefly in the muscles, and is due not only to continuous over-action of the catabolic or excitator nerves, but to paresis or under-action of the anabolic or inhibitory nerves. The result is excessive oxidative or destructive metabolism, and deficient constructive or reparative metabolism of the muscular tissue. This is evidenced clinically by the excessive discharge in the breath of carbonic acid, and in the urine of nitrogenous waste products (excessive as compared with those derived from the food

taken), and by the visible wasting and enfeeblement of the muscles.

Hyperpyrexia.—If the nervous disorder be more profound, affecting alike thermotaxis, thermogenesis, and thermolysis, the latter may fail altogether to overtake the excessive heat production, with the result that the temperature steadily rises until the disorganization ends in death. This condition, which without prompt and adequate treatment is almost always fatal, is called *hyperpyrexia*. Cases, indeed, occur in which the temperature continues to rise after both respiration and circulation have ceased, the thermogenic activity of the muscles, like their contractility, surviving somatic life, while physiological thermolysis is in abeyance.

Ætiology.—The nervous disorder which shows itself as fever may be occasioned by lesions which are (1) thermal, (2) mechanical, or (3) chemical; to these we may add (4) reflex, though it is not certain that this group of causes is unrelated to the others.

(1) *Thermal.*—Prolonged exposure to hot air or water, by which, in the first place, the normal loss of heat from the skin by radiation and evaporation is checked, and, in the second place, the thermotaxic and inhibitory thermal mechanisms are at length exhausted or damaged owing to the continued strain upon them, gives rise to fever. This is usually accompanied by other signs of nervous disturbance, such as delirium or coma, and is known as sun- or heat-stroke, or heat-apoplexy. The thermal disorganization is very apt to pass into the graver form of hyperpyrexia.

The rational *treatment* is by every means to abstract heat from the body, and this is best done by the immediate and persistent application of ice or cold water.

(2) *Mechanical.*—Tumours, hæmorrhages, embolisms, structural degenerations and traumatic injuries, whether in the brain or the spinal cord, may, if they involve the proper thermal tracts or centres, give rise to pyrexia. But similar lesions may equally well cause thermal ataxia, and if thermogenesis be checked or thermolysis increased, they may cause a fall and not a rise of temperature. Cases of each kind are on record.

(3) *Chemical.*—Substances which act injuriously on the nervous system, and especially on the thermal mechanisms, may reach them through the blood, and are probably the commonest causes of

fever. They may be produced (*a*) within the tissues themselves, when they are the result of morbid metabolism, *e.g.* in rheumatism, or of normal waste which has failed to be eliminated, *e.g.* in gout; or (*b*) in some natural or morbid cavity of the body the result of the action of living micro-organisms on blood or tissue or secretion (specific infective diseases, pyæmia, septicæmia); or (*c*) without the body, being introduced by injection into the blood (atropine, certain albumoses).

(4) *Reflex*.—The best example is probably the “urethral fever,” which in some sensitive persons immediately follows the introduction of a catheter. Of this kind may be also the pyrexia which accompanies sudden and very painful injuries and local inflammations without suppuration, but associated with painful tension.

Clinical Terms.—The temperature is the most convenient index of pyrexia, though we have seen that it is not a perfect one. In this respect it resembles the state of the tongue, which, with certain reservations, indicates the condition of the digestive tract, and the state of the pulse, which tells us much, but not everything, of the condition of the circulatory system.

In most cases of pyrexia the temperature rises (onset), continues with moderate fluctuations for some days (acme), and then falls (defervescence), either suddenly (crisis) or by a succession of steps (lysis), to or below the normal. If the fall extend much below the normal, we have “collapse,” often a fatal sign. This is the type of a so-called “continued” fever, and is characteristic of many of the specific infective diseases.

In “hectic” (or habitual) fever, characteristic of tuberculosis, there is, for an indefinite period, a daily evening rise and morning fall of temperature, the fluctuations being large (3° to 5° F.) and rather irregular.

In “intermittent” fever, which is practically synonymous with ague (malarial fever), every day (quotidian), two days (tertian), or three days (quartan) there is an abrupt rise, a brief acme, and a crisis, the whole occupying only a few hours, and the temperature between the attacks being normal.

In “remittent” or relapsing fever we have a succession of attacks of continued fever, each lasting for a few days, and separated by intervals free from pyrexia.

Temperatures are also classified according to a rough clinical scale origin-

ally proposed by Wunderlich, who may be called the founder of clinical thermometry. Thus, temperatures of—

99.5° to 100.4°	arc sub-febrile.
100.4 „ 101.3	„ slightly febrile.
101.3 „ 103.1 (evening)	„ moderately febrile.
103.1 „ 104.9 (evening)	„ markedly febrile.
Higher temperatures	„ highly febrile.

Recovery.—In the Gulstonian Lectures for 1887, delivered by the writer, the process of recovery from a typical febrile attack is thus described:—“First, the thermolytic mechanism is waked to adequacy, there is a critical sweat or a relaxation of the vessels of the skin, and a gush of heat from the surface brings down the temperature with a run. But the thermogenic centres have not yet recovered, and the temperature will swing backwards and forwards for some days, and an epicrotical excretion of urea takes place. Thermogenesis becomes less and less excessive, and is vigilantly counterbalanced by thermolysis; but thermotaxis is yet feeble. The patient’s temperature is down, but it is yet far from stable. As convalescence proceeds the stability increases, thermotaxis, the first to be disturbed and overthrown, being at last restored.”

Treatment.—The treatment of a disease accompanied by fever must be directed chiefly to the removal or modification of the primary cause of the disease. When this cannot be done, and when the fever, either by reason of its duration or of its intensity, becomes itself a source of danger, it is advisable to employ antipyretic methods. These are directed, first, to increase thermolysis; secondly, to diminish thermogenesis. We have no certain knowledge of any whose chief or primary action is on the thermotactic mechanism.

Heat loss may be increased with advantage, especially where the skin is dry, by increasing its vascularity and stimulating its sweat glands. For this purpose, alcohol in small and frequent doses, spirit of nitrous ether, and solution of the acetate of ammonium, with abundance of water to drink, are the simplest agents. In the earliest stage, aconite (1 minim of the tincture every five minutes till 30 minims have been given) has a useful effect in relaxing the superficial arterioles, and so discharging heat from the skin; but it is of little

value when the fever has reached its height. Heat may also be actively abstracted, and in long-continued fevers with the best results, by the use of the cold or gradually cooled bath. In rheumatic fever, and especially in enteric fever, its efficacy in preventing exhaustion, in promoting comfort and refreshing sleep, and in averting danger to the brain and tissues is now beyond dispute. Simple sponging or other local application of cold is soothing but of comparatively small value as an antipyretic method. The patient should be immersed for from four to ten minutes in an ample bath, the water being at a temperature of 65° to 70° F., and the bath should be repeated as often as the temperature rises to a certain point. This point will depend on the severity and course of the disease; thus, in moderately severe cases of enteric fever it may be fixed at 102.5° F., in rheumatic fever with a tendency to hyperpyrexia, at 103.5° F. In the somewhat rare instances when the patient evinces great repugnance to the cold water, he may be immersed in a tepid bath at 80° F.; the temperature of the water may then be lowered by the addition of pieces of ice. On removal from the bath he should be very lightly covered. This method has been more thoroughly pursued on the Continent than in this country, and Naunyn, after a large experience of it, is able to say, "I consider it proven, as a matter of statistics, that the cold-bath treatment of enteric fever shortens the duration of individual cases, and, above all, very considerably reduces the mortality—namely, from 15 to 20 per cent. to 5 to 10 per cent."

Of drugs whose action is to check thermogenic metabolism, either directly within the muscles or through the nervous system, we have now a large and increasing number. Quinine in full doses (10 to 20 grains once or twice a day), and salicylic acid, with its allies, salicin and the salicylates (*e.g.* 20 grains of sodium salicylate in solution every three or four hours), are the more familiar of these; they tend to allay the pyrexia of almost all diseases, but quinine is much more efficacious in intermittent than in continued fevers, and the salicyl compounds in fevers due to rheumatic causes than in any others.

Chinolin, resorcin, kairin, thallin, have all marked antipyretic qualities, but their occasionally excessive action and other grave disadvantages have caused them to fall out of use in fever. The more

recent products of synthetic organic chemistry, to which the trivial or non-systematic names, antipyrin, antifebrin, phenacetin, methacetin, pyrodon, and so on, have been given, are in many respects superior, and have come largely into use. Of these, antipyrin is the most to be recommended; it has more advantages and, on the whole, fewer drawbacks than any of the others. It may be given in doses of 15 grains, dissolved (say) in cinnamon or camphor water, at intervals of four to six hours when it is desired to maintain the temperature at a point not higher than 100° F., and this effect may be maintained for several days by slightly shortening the intervals between the doses. It is also useful as an adjunct to cold applications in cases of heat-stroke. In a small proportion of cases it causes an erythematous rash, which is harmless, and disappears in three or four days.

Antifebrin is cheaper than antipyrin, and the effective dose is smaller (3 to 5 grains); but it is much less soluble, and is too apt to give rise to cyanosis or to anilin-poisoning. Phenacetin is also nearly insoluble; it is best given in powder or lozenges (5 to 10 grains), and its action on the temperature is gradual and very durable (eight to ten hours). In ordinary doses it does not produce any untoward effects. All three drugs are apt to give rise to profuse perspiration, but this in itself is no disadvantage. Pyrodon depresses the temperature very powerfully, but it is a dangerous drug, and should be avoided in ordinary practice. These antipyretics have all valuable analgesic and other properties, which, however, need not be referred to here. They produce no obvious effect on the primary disease, and their main action is in all probability exerted on the thermogenic mechanism, stimulating inhibition and depressing over-activity. The improvement in the patient's condition they produce seems to be entirely dependent on the assuaging of his pyrexia. They should be avoided in cases where the heart is flagging or actively diseased (myocarditis, ulcerative endocarditis, diphtheria), after great hæmorrhage, during the catamenia, in massive pneumonia with pulmonary œdema, and in the late stages of tuberculosis or other long-continued and exhausting malady. As a general rule, they should at first be administered in small doses, the effect on the temperature and on the heart being observed: this will give data for determining the

amount and frequency of the dose appropriate to the particular case.

DONALD MACALISTER.

FILARIA SANGUINIS HOMINIS—An embryo of a minute nematode worm which infests human beings in certain tropical climates.

The female is "a long slender hair-like animal quite 3 inches in length, but only $\frac{1}{16}$ inch in breadth, of an opaline appearance, looking, as it lies in the tissues, like a delicate thread of catgut animated and wriggling. A narrow alimentary canal runs from the simple club-like head to within a short distance of the tail, the remainder of the body being almost entirely occupied by the reproductive organs. The vagina opens about $\frac{2}{5}$ inch from the head; it is very short, and bifurcates into two uterine horns, which stuffed with embryos in all stages of development, run backwards nearly to the tail" (Manson). The male is considerably smaller than the female.

The parent worm inhabits the lymphatics; into these the embryos are discharged, and, making their way into the thoracic duct, reach the blood. They can, however, be found in the blood only during certain hours, as a rule between 6 P.M. and 9 A.M., but Dr. Stephen Mackenzie has shown that by reversing the habits of the patient, making him sleep in the daytime and keep awake at night, the filariæ make their appearance in the day instead of at night.

The life history is as follows:—A particular kind of female mosquito sucks the blood of a person infected with filariæ, and thus swallows some of the embryos. Five or six days afterwards she deposits her ova on some pond, and dies. Meanwhile, most of the embryos have died, but some may have undergone development and transformation, and are now possessed of a head with papillæ, an alimentary canal and rudimentary generative organs. In this state they are liberated from the body of the mosquito, but it is not known with certainty how they get into the human body—possibly through the drinking water.

From the human stomach they at once pass into the lymphatics, where they remain permanently located. Though constantly discharging large numbers of embryos into the lymphatics, their presence may give rise to no symptoms at all, and it is only when the ova are prematurely discharged that ill results occur. The embryos, when fully developed, are extremely narrow, elongated, encapsuled

bodies, capable of passing the most minute capillary network, but at an earlier stage of their development they are round, and of much greater diameter. When, therefore, they are prematurely discharged, being carried by the lymphatics to the nearest gland, they are there arrested. In this way complete lymphatic obstruction is brought about, and the diseases known as elephantiasis, lymphoscerotum, and chyluria (*q.v.*) are the result, according as the lymphatics of the legs, scrotum, or pelvis are obstructed.

JOHN ABERCROMBIE.

FLUCTUATION.—When fluid is present in a cavity, if the hands be placed at opposite points on its walls and a sharp tap be given with a finger of one hand, a shock is felt by the other. This sign is termed "fluctuation," but the same term is also used to describe the sensation received when alternate pressure is made over an abscess or through a joint containing fluid. In the case of a cavity it is essential that it should not be very small nor the fluid too thick. When the abdomen is very tense, it may be necessary for an attendant to place the edge of his hand along the linea alba in order to arrest the vibrations of the abdominal walls which are produced when a tap is given to the side, otherwise they may be mistaken for the fluctuation of fluid within the peritoneum.

FOMENTATION.—When the local effects of heat are needed, but the use of a poultice is not desirable, a fomentation will generally best fulfil the indications. It may be moist or dry. If the former be preferred, a flannel or cloth is placed in boiling water, then thoroughly wrung out and applied to the part as hot as it can be borne, and covered with oiled silk or waterproof. As compared with poultices, hot fomentations have the advantages of being more cleanly and lighter, the disadvantages being that they cannot be used where there is an open wound, and that they speedily lose their heat, and therefore require to be changed frequently—every half-hour or so. Hot moist fomentations are especially useful in cases of peritonitis, and in renal and other forms of colic. Their action may be aided by the addition of a few drops of turpentine (the so-called turpentine stupe), or, if a sedative effect be desired, by sprinkling a drachm or more of laudanum over the flannel, or by using

a decoction of poppy-heads¹ instead of boiling water. The decoction is prepared by boiling $\frac{1}{2}$ lb. of poppy-heads in 2 quarts of water for ten minutes, straining and allowing the clear fluid to stand by the fire. Instead of cloths or flannel, spongio-piline may be used in a precisely similar way, and it has the advantage of retaining the heat rather longer. Sometimes dry fomentations are preferable; for this purpose either hot bran or chamomile flowers are applied in bags, or a piece of flannel or cotton-wool simply warmed in front of the fire. This method is particularly applicable for the relief of earache or colic.

FOURTH NERVE, Diseases of the.—This nerve, which emerges from the valve of Vieussens and courses round the outer surface of the crus cerebri to supply the superior oblique muscle in the orbit, is liable to be paralysed from neuritis due to syphilis, from compression by tumours at the base of the brain, by an aneurysm of the internal carotid, and by growths in the orbit. The nucleus in the upper part of the floor of the fourth ventricle is liable to be destroyed by tumours inside the pons, and may undergo atrophy in association with the other ocular nuclei, as in ophthalmoplegia externa.

The *symptoms* are diplopia and a slight amount of paralysis, observed when the patient looks downwards. The action of the superior oblique is to direct the eyeball downwards, and at the same time to rotate it so that the upper end of its vertical axis comes nearer to the middle line; the defect of movement is therefore downwards and inwards, but it is often too slight to be noticed. Diplopia is present on looking downwards, and the false image is below the true one, and its upper end is tilted towards the middle line of the body. This obliquity is increased by looking outwards, whilst the difference in vertical level between the two images is increased by looking inwards. The obliquity of the false image is due to the loss of rotation inwards of the upper end of the vertical axis of the eyeball. What is called the secondary deviation of the sound eye is in a direction downwards and inwards. To obviate the diplopia the patient inclines his head forwards and towards the sound side.

Treatment.—As syphilis is the most common cause of paralysis of this nerve, iodide of potassium should be given in

large doses. When the lesion is due to the presence of a tumour, the same treatment is advisable, as the growth may be of syphilitic origin.

C. E. BEEVOR.

FRAMBÆSIA (Yaws; Pian; Endemic Verrugas).—A tropical, contagious disease, endemic in the West Indies, South America and Africa, chiefly affecting the coloured races, and of especial frequency between the ages of ten and twenty years. The disease begins with feverish symptoms and severe pains in the limbs, followed by mottling of the skin and branny desquamation. Papules and flat tubercles, sometimes as large as peas, then appear, and are distributed all over the body, but most thickly over the exposed parts. The tubercles break down, discharge a thin yellow fluid, and ulcerate. From the ulcers thus formed the red, fungating, raspberry-like excrescences characteristic of the disease arise. The affection runs a definite course, and generally subsides within two years. One attack affords protection against a second. No scars result from the ulcers. Competent authorities, thoroughly familiar with the disease, consider it to have no relation to syphilis, and it is said to be aggravated by the administration of mercurials.

Treatment.—The disease is uninfluenced for good by treatment.

J. J. PRINGLE.

FRECKLES are minute, irregularly shaped accumulations of the normal pigment of the skin, varying in colour from fawn-yellow to deep brown. They never occur in very young children or in advanced age. They are commonest in fair people, especially those with red hair and fine complexion, are usually most marked on the face and backs of the hands, and are aggravated by exposure to the sun, although not primarily due to it, as they occur ("cold freckles") upon parts of the body seldom exposed to its rays, especially on the buttocks, back and penis. They generally first appear in summer and partially disappear in winter. Freckles frequently give rise to considerable disfigurement, but cause no subjective symptoms.

The *treatment* is that of chloasma (*q.v.*).

FREMITUS.—Vocal fremitus is the thrilling sensation conveyed to the hand when applied to the chest of a person during phonation.

The nature of the sensation perceived will depend upon the character of the voice, there being wide differences in this respect. The deep tones of a man's voice are always much better conducted than the higher-pitched voice of a woman or child. The amount and kind of the tissues interposed between the hand and the lung will also influence the vocal fremitus, which is usually more marked in lean persons. Any condition which produces consolidation of the lung will increase the vocal fremitus, provided the bronchi be patent; whilst the presence of fluid between the lung and the chest wall will diminish it, or altogether prevent its being felt.

The vocal fremitus beneath the right clavicle is normally more distinct than on the opposite side. If, therefore, the vocal fremitus be equal on the two sides, and well marked, it is probably increased at the left apex, and a presumption arises that the left upper lobe is the seat of disease. If the fremitus be more marked at the left apex than the right, the presumption that the left upper lobe is affected is still stronger. If, on the other hand, the vocal fremitus beneath the clavicles be equal, but less marked than normal, probably the voice conduction is diminished at the right apex, and the condition of the right upper lobe must be carefully investigated in the further course of the examination. What has been stated as to the conditions and significance of the vocal fremitus beneath the clavicles applies equally to the supra-spinous fossæ.

Rhonchal fremitus is felt when the vibrations produced by the passage of air through a large bronchial tube, narrowed by the presence of mucus, are sufficiently intense to reach the hand applied to the chest. It is often present in bronchitis, and is especially frequent in the case of children suffering from that disease.

Friction Fremitus.—The vibrations produced by the rubbing together of two dry surfaces of the pleura, and very rarely of the pericardium also, may sometimes be appreciated by the hand. The above term is used to indicate this sign. It is not uncommonly present in cases of dry pleurisy.

Tussive fremitus is felt when the hand is placed upon the chest whilst the patient coughs. It is sometimes of use in diagnosis in the case of children, and in adults when the condition of the voice prevents the conduction of the vocal fremitus.

Hydatid fremitus is the sensation occasionally elicited by percussion over the site of an hydatid tumour, usually of the liver. Three fingers are placed over the site of the tumour, and the middle one is sharply percussed, when a thrilling sensation may be perceived by the other two. This sign is present in only a very small proportion of cases, and is therefore of comparatively little value in diagnosis. J. K. FOWLER.

FRICTION SOUND is the name given to the rubbing, crepitant, or creaking sound heard on auscultation over the large serous sacs when their ordinarily smooth surfaces are roughened, usually by an inflammatory exudation.

In the case of the *pleura*, apart from the rubbing nature of the sound, its evidently superficial character, and the fact that it is usually audible both with inspiration and expiration, help the diagnosis; but it is often very difficult to decide whether a sound having a crepitant character is of pleural or pulmonary origin. If the sound be audible only at the end of a deep inspiration, if it remain unchanged by cough, and if there be localized pain increased by inspiration, it is probably due to the presence of a patch of recent lymph on the underlying pleura, or of fine fibrous adhesions. The pleural origin of a crepitant sound is often indicated by the discovery of a "rubbing" friction sound in its immediate neighbourhood.

A pleural friction sound in the precordial area may acquire a "to and fro" character under the influence of the movements of the heart. Such a sound usually ceases when the lung is fixed by holding the breath after a deep inspiration.

Pericardial friction sound may be single or double, occurring with either systole or diastole of the auricles or ventricles, or with both.

It may be distinguished from a valvular murmur, for which it is liable to be mistaken, by its rough and superficial character, by the fact that it is not most distinct at the normal sites of maximum intensity of valvular murmurs, and often from its want of exact synchronism with the systole or diastole of the ventricles (*see* PERICARDIUM, DISEASES OF).

Peritoneal friction sound is most often heard over the region of the liver, as the organ moves during respiration, and indicates the presence of peri-

hepatitis, which may be either a local affection or part of a general inflammation of the peritoneum. It may be occasionally distinguished over other areas of the abdomen when the serous membrane is roughened by inflammation, or from the presence of morbid growths.

J. K. FOWLER.

FROSTBITE is a form of inflammation of the skin and deeper parts produced by prolonged exposure to cold, and tending to terminate in gangrene.

The parts chiefly affected are the fingers, toes, tips of the ears, and nose, where the circulation is weak and a large extent of surface is exposed to the air. In this country fatal exposure to cold is rare.

Anæmic persons of either sex are specially prone to suffer, and in them a temperature several degrees above freezing-point may be sufficiently low to cause frostbite.

Symptoms.—The milder forms of the

conditions are described under the heading of **CHILBLAIN** (*q.v.*). In the more severe forms, the part attacked is at first pale, wax-like or mottled, and senseless; afterwards, it becomes covered with bullæ, the contents of which are often hæmorrhagic. The accompanying general phenomena are those produced by excessive cold (stupor, somnolence, coma). When thawing is complete, an inflammatory line of demarcation between the healthy and gangrenous parts shows itself. Days, or even weeks, may, however, elapse before the amount of tissue which has been actually destroyed can be determined.

The *prognosis* ought always to be somewhat guarded, more especially in the case of infants and old persons. Death often results from phlebitis and septicæmia.

The *treatment* of the milder forms is described under **CHILBLAIN**. In severe cases, amputation must be performed after the formation of a distinct line of demarcation.

J. J. PRINGLE.

G

GALL-BLADDER, Diseases of.

—The gall-bladder is liable to various diseases, in part originating in itself, in part depending upon its relation to the bile ducts, in part, again, secondary to diseases of the liver or of adjacent organs.

Dropsy.—When the cystic duct becomes occluded by a gall-stone or a parasite, or, as the result of inflammation or of some morbid growth, no bile can find its way into the gall-bladder, which may become distended with a clear watery mucus secreted by its lining membrane. This is called dropsy of the gall-bladder, and the result is the formation of a pyriform elastic tumour, to be felt on the right of the middle line, in the normal portion of the gall-bladder, or possibly much lower down in the abdomen. In several instances such tumours have been so freely movable and so far from the normal situation as to have been diagnosed as floating kidney.

The *symptoms*, apart from the presence of the tumour, may be negative. There may be *pain*, and this is generally the case when the condition comes under notice.

Treatment is only called for when pain is present, and in such cases cure has followed the operation of opening the

gall-bladder after abdominal section and stitching its walls to the edges of the wound. A fistulous opening may remain for some time, but generally closes eventually.

Inflammation.—By extension of catarrh from the biliary ducts the mucous membrane of the gall-bladder may become involved. Acute catarrh is generally caused by extension of a similar inflammation from the duodenum; chronic catarrh, on the other hand, often occurs in chronic congestion of the liver, as in heart disease. But both may be caused by direct irritation of the cystic mucous membrane by abnormal bile, gall-stones, or parasites in its cavity. These last are also prone to set up a form of inflammation in which the lining is covered with false membranes, or may even cause phlegmonous inflammation, with suppuration and ulceration. Phlegmonous inflammation may also be caused by extension from an abscess in the liver. Ulcerative inflammation is apt to pass on to gangrene.

In all these conditions the affection is but part of a complex of symptoms. These are described under the diseases to which they properly belong, and with which their prognosis and treatment are necessarily involved.

Ulceration may lead to the formation of *biliary fistule* communicating either with the intestine or the internal surface of the body.

New Formations.—Cancer of the gall-bladder is so often associated with the presence of gall-stones (*q.v.*) that it is probable that the irritation they set up determines its occurrence. The gall-bladder may also become involved in cancer of the stomach, intestine, bile ducts or liver.

Parasites.—The gall-bladder may be invaded by various parasites, especially by *distoma hepaticum*, *ascarides*, and *hydatids*. The presence of any of these may give rise to symptoms of obstruction of the cystic duct, or may cause inflammation and even ulceration of the cystic mucous membrane.

ROBERT SAUNDBY.

GALL-STONES.—The gall-bladder frequently contains calculi, which may be single or multiple, as large as a pigeon's egg, or as small as sand, faceted or rounded, or presenting numerous small roughened excrescences on their surfaces. Such concretions are often found post-mortem in the bodies of persons who have in nowise suffered from their presence during life.

They are composed of cholesterine, bile pigment, bile acids, fatty acids, salts of lime and magnesia, mixed with mucus, sodium chloride, iron and water.

The chief component is cholesterine, and sometimes pure calculi of this substance are met with.

The formation appears to depend upon the precipitation of cholesterine and bile pigment from deficiency of sodium salts in the bile. In addition, the presence of lime appears to favour this precipitation, as this earth readily forms insoluble salts with the bile acids (Bonchard). A third factor is to be found in the concentration of the bile, which takes place rapidly when it remains long in the gall-bladder, so that any circumstances which favour the retention of bile in this situation also favour the formation of calculi.

It follows from the foregoing that gall-stones are prone to form in persons who take large quantities of highly nutritious food, who use water strongly impregnated with lime, and whose habits are sedentary. There is a close, but not constant, relation between obesity and gall-stones, and, in addition, sufferers from biliary calculi frequently also pass uric acid stones from the kidneys.

Heredity and gout both play an im-

portant part in the ætiology, and the general causes of the uric acid diathesis may all aid in the production of the affection. In addition, tight lacing, habitual constipation, and pregnancy are alleged to favour its development.

Biliary calculi are most common between the ages of twenty and forty years. Females are much more often affected than males; the proportion of liability has been estimated as high as 4 to 1.

Symptoms.—As has been already stated, gall-stones may be present for many years, and in large numbers, without giving rise to symptoms, which are not usually very acute unless the calculus become involved in the cystic or common bile duct. This happens in consequence of active peristalsis in the gall-bladder, such as occurs during digestion, but it is especially from the use of purgative medicines acting on the duodenum that the violent contractions which precipitate an attack of biliary colic are induced.

The calculus may ulcerate through the wall of the gall-bladder, and escape into the duodenum, the colon, or the peritoneal cavity and set up peritonitis, or may, after the formation of an abscess, be discharged externally through a fistulous opening in the integuments. Of these events the first named is the most common. If a calculus of large size pass into the duodenum, it may subsequently cause intestinal obstruction (*q.v.*).

The symptoms of gall-stones are mainly observed in the acute attack, called **biliary colic**, which is characterized by pain in the hypochondrium of an excruciating character, radiating all over the thorax, and often accompanied by agonizing pain between the shoulders, with a general sense of constriction of the chest. It is noteworthy that the pain of biliary colic is mainly thoracic, while that of renal colic is abdominal. With the pain, which is often so intense as to cause the patient to roll about, cry out and sweat profusely, there is *vomiting*, which seems to give some relief to the pain. After an hour or more the pain abates, but there remains considerable tenderness in the region of the gall-bladder, and frequently, if palpation be possible, a tumour due to the distended gall-bladder can be felt.

Jaundice is not an essential part of this complex of symptoms. Obviously, no jaundice will be caused unless the stone pass along the cystic duct and get impacted in the common duct. But probably many stones, after getting into the cystic duct, drop back into the gall-bladder; whereas others which are large

enough to cause great agony whilst passing along the slender cystic duct, are not too large to pass through the common duct, and to escape into the duodenum without difficulty.

A *local rise of temperature* over the region of the gall-bladder is stated to occur (Peter), and is held to furnish valuable diagnostic information.

When the stone gets impacted in the common duct, very persistent jaundice may result, and the liver may become enormously enlarged, all the ducts being dilated by the accumulated bile, so that the organ comes to resemble in texture a large sponge full of bile. As the result of septic changes, the retained bile may become transformed into pus, the liver being found on autopsy to be riddled with small abscess cavities.

The stone, after obstructing for a time the common duct, may slip back again into the cystic duct or into the gall bladder, the flow of bile becoming temporarily re-established and the jaundice disappearing, a sequence of events which may be several times repeated. In other cases the liver undergoes interstitial inflammation, and becomes cirrhotic, forming one type of "hypertrophic cirrhosis."

Gall-stones give rise to inflammation of the gall-bladder, and in some cases the cavity may become distended with pus, causing a tumour similar to that described as the result of dropsy, and which has been successfully treated in the same way. There is also reason to believe that they are capable of giving rise to irritation, which leads to the formation of cancer (*vide supra*).

The presence of stones in the gall-bladder sometimes gives rise to attacks closely resembling ague—chills followed by fever, and terminating by sweating.

The *treatment* of an attack of biliary colic is best effected by the hypodermic injection of morphine in sufficient quantity to allay the pain (gr. $\frac{1}{4}$ to $\frac{1}{2}$). Hot fomentations, if they can be borne, may be applied to the seat of pain.

After the attack, the patient should be warned against the use of purgative medicines. The bowels should be regulated by diet, and the use of some simple laxatives if required. The diet should be regulated, especially as to quantity, overloading of the stomach at any meal being prevented; the use of beer and strong wines and hard water should be forbidden; a tumbler of Vichy water (Célestine or Haute-Rive) should be taken twice a day with a table-spoonful of

lemon-juice, and a pill containing $\frac{1}{2}$ grain of pulv. ipecac. prescribed night and morning. The patient should be enjoined to take regular exercise, and tight-lacing should be avoided.

If a gall-stone become impacted in the common duct, and persistent jaundice ensue, ipecacuanha may be given in order to increase the fluidity of the bile, and attempts may be made to dislodge the calculus by the use of duodenal purgatives, calomel (gr. ij to gr. v), or sodium sulphate (3j) (Carlsbad salts)—drugs which cause active peristalsis.

Success may occasionally attend such treatment, but more often the case ends fatally unless relief can be obtained at the hands of the surgeon. Great success has followed the operation of *cholecystotomy*, or opening the gall-bladder, for the removal of calculi. It may be recommended when the gall-bladder can be felt below the costal margin, and when there are urgent symptoms pointing to the presence of a calculus. If there be jaundice, the indications for the operation are not so clear, as the calculus has certainly passed beyond the cystic duct, but in some cases it has been found possible to press it back again into the gall-bladder, or to crush it *in situ* and remove the fragments through the opening in the gall-bladder. Another objection to the operation where jaundice is present arises from the fact that such cases are often complicated by cancer of the gall-bladder. It is, however, quite justifiable to determine this fact in doubtful cases by laparotomy.

ROBERT SAUNDBY.

GARGLES are liquids used for local application to the fauces. A small quantity—about a table-spoonful—is taken into the mouth, and, the head being thrown well back, the fluid is agitated by means of the air expelled from the larynx, so as to bring it into contact with the mucous membrane around. Many persons cannot permit the fluid to go beyond the uvula without immediately swallowing it. The use of sprays and lozenges, or brushing the throat with an astringent solution, is rapidly superseding the gargle in the direct treatment of affections of the fauces.

GASTRIC FEVER.—This is a popular term which has not any precise scientific meaning. It is used indiscriminately by the laity for any febrile ailment of a not very transient character

in which abdominal symptoms are prominent. In a good many instances the malady is enteric fever; in not a few it is tuberculosis; whilst in many cases it is a condition of catarrh or febricula not coming under any of the well-recognized visceral disorders.

GENERAL PARALYSIS OF THE INSANE (General Paresis; Paralytic Dementia; Paretic Dementia).—A disease of the nervous system especially affecting the brain, characterized clinically by progressive loss of power and sensation, and by mental deterioration, tending invariably to dementia, though often for a time presenting exaltation and expansive ideas, almost invariably fatal, and generally presenting post-mortem evidence of organic changes in the brain and its tunics.

General paralysis may be divided into three stages—(1) a period of mental alienation, associated with fibrillar tremblings, chiefly noticeable in the tongue and facial muscles; (2) a period of chronic mental failure and bodily decay; (3) a stage of complete mental ruin, in which the patient is fatuous, and exhibits entire failure of the bodily functions—motor, sensory and nutritive.

The first stage is by some divided so as to make a prodromic or incubative period, but for all practical purposes the division into three stages is sufficient. Many cases, however, diverge very markedly from this arrangement, as in some the motor signs are for a time in abeyance, whilst in others they appear before the characteristic mental failure. The essential feature of the disease is a progressive decay of both the mental and bodily powers.

First Stage.—During the early period of this stage there is often considerable difficulty in deciding as to the nature of the disease, there being generally some alteration in the moral nature before the friends notice any bodily defect, so that a gradual alteration of character may take place, and may lead the patient into legal difficulties, and render him liable to prosecution for such criminal acts as incendiarism or rape, or cause him to become the prey of designing persons, before the insanity is recognized. The principal mental symptoms to be noticed at this period are alterations in demeanour, conduct, temper, and disposition; enfeeblement of memory and loss of power in the highest acquirements, especially if the latter be of a

nature demanding much skill and originality; childishness and emotional display; excessive sexual desire, often accompanied by loss of power; lascivious acts, untruthfulness, stealing (often without any attempt at concealment); mental depression, with some consciousness of impending failure of powers, or a gay, hilarious, reckless, expansive feeling of well-being, with benevolence.

With these symptoms great changeability and inability to fix the attention are often associated. Insomnia is common, or there may be excessive drowsiness at unusual times of the day. Acts of violence may occur, or a fortune may be squandered, or the patient may enter into schemes which lead to his own ruin and that of others.

The principal bodily symptoms and signs in the early period are some defect of sight, hearing, or smell, which may exist long before the disease declares itself; headache, a feeling of confusion in the head, neuralgia, and diminished cutaneous sensibility. Occasionally there is ocular paralysis, and the pupils are frequently irregular or minutely contracted. Fibrillar tremors of the tongue and lips are often present, especially when the patient attempts to speak. Feebleness of gait may be noticed, whilst in some cases definite locomotor ataxy precedes for a long period the mental symptoms. The handwriting in the early period is characterized by the omission of terminal letters or syllables, the repetition of words, careless or untidy penmanship, or perhaps actual shakiness in the formation of letters; but in some cases the handwriting of a naturally careless penman will improve from the fact that he becomes conscious of the necessity for effort in writing. The speech may be hesitating, or slow and monotonous; words may be omitted or repeated. Occasionally retention or incontinence of urine or fæces occurs early in the attack. Finally, the occurrence of epileptiform or apoplectiform seizures may be the first symptom to call attention to the disease.

The early phenomena may pass imperceptibly into a definite mental alienation characterizing the first stage, or there may be some acute mental disturbance marking its distinct onset.

Any clinical form of mental disturbance may occur, so that the onset may be maniacal, melancholic, stuporous, or of the nature of dementia, the physical signs in some cases not being manifested for many months. If the onset be mani-

acal, the attack may be attended by all the violence, sleeplessness, destructiveness, and mental confusion of a severe attack of acute mania, but with this there will be associated delusions of an ambitious or expansive nature.

Delirium of exaltation, in which the patient has exaggerated ideas of his wealth, strength, position, and powers (sexual and otherwise), often of the most extravagant nature, but varying from day to day, and being always confused and contradictory, in contrast to the fixed ideas of grandeur in some cases of monomania, is a very frequent and most important symptom. Formerly this kind of delirium was looked upon as a *sine quâ non* for the diagnosis of general paralysis, but it is now well recognized that many cases commence with, or are characterized principally by, depression. This may vary from hypochondriacal delusions, such as that the bodily organs are lost, rotten, or obstructed, or that the patient is dead (necromimesis), to melancholic sadness with hallucinations of a persecutory nature. Food may be refused, and there may be a suicidal tendency, or even a condition resembling melancholia with stupor. According to Mickle, "melancholia, when it occurs as a temporary phase, is associated rather with the commencement of the disease, hypochondria with the middle part of its course, though each may be found in any part."

If the attack be characterized by dementia at the onset, the symptoms are more likely to be a gradual loss of memory (first affecting that for recent events), of reason, and will-power, with failure of the moral faculties, and perhaps slight temporary excitement or extravagance, and a sense of well-being. Incontinence of urine and fæces are apt to occur.

Whatever be the form of onset, dementia is the natural tendency of the disease, and therefore, even in the melancholic form, loss of memory and dirty habits are likely to occur with much greater certainty and frequency than in ordinary melancholia. In rare cases, attacks of excitement and depression alternate, the disease being then known as *general paralysis of the double form*.

The characteristic motor signs of general paralysis may be masked at the onset by maniacal excitement or stupor, or may not be exhibited till long after the mental symptoms. When present, however, some or other of the following will be found: An increase of the difficulty

of speech, which may occur very early in the attack, and is principally noticeable in the attempt to articulate words containing many consonants or many syllables, some of which are frequently omitted. There may also be stoppage or stuttering, or great effort to get words out, associated with marked twitching of the lips or face.

In the expansive and maniacal forms there will frequently be great loquacity, but amnesia is most often seen in the variety commencing with dementia. The affection of speech is always more marked as the patient becomes fatigued with talking. The tongue is protruded with difficulty, or jerked out, and is often rested on the lower lip as if for support, and shows marked fibrillar tremors. Sucking or swallowing or masticatory movements are of common occurrence. There is usually a loss of expression in the lower part of the face, the lines becoming smoothed out. The occipitofrontalis muscle, however, is frequently observed to be contracted so as to produce an aspect of surprise, or the expression of different parts of the face may vary so as to give an incongruous effect.

There is impairment in manual dexterity, the writing showing a similar condition to the speech—namely, omission of words and syllables—or the result may be a confused jumble of inconsequent sentences. Moreover, in the patient's letters obscene remarks or allusions to his wealth or powers are frequently found. The grasp of the hands becomes feeble, or perhaps unequal and tremulous. The gait may be ataxic, with absence of the knee-jerks, or spastic, with exaggerated reflexes, or else simply awkward, clumsy and tottering, with a tendency to trip against obstacles. Occasionally the knee-jerks are different on the two sides. Apoplectiform or epileptiform fits may occur, but are not so common as in the later stages of the disease.

The pupils may be equal, and react to light normally, but in a large number of cases they are unequal in size or irregular in shape, and sluggish in reaction to light, or they may exhibit extreme contraction. In ataxic cases the typical Argyll-Robertson pupil is frequently found.

The skin is generally coarse, greasy, or muddy-looking; in some cases there is great pallor, in others a florid condition of the cheeks; sudden flushings of the head and face may occur, and there may be herpetic or other eruptions.

With regard to sensory symptoms, there may be defect of colour-sense or defective vision; the latter is sometimes associated with atrophy of the optic discs. There may also be hallucinations of any one or of all the senses. The muscular sense is perverted, giving rise to feelings of increased size (megalo-manie) or shrinking (micromanie). Voisin insisted on early loss of the sense of smell, especially for pepper, as an important symptom, but this has not been corroborated by other observers. There is sometimes cutaneous hyperæsthesia, but more frequently a general dulling of sensibility. Occasionally *hæmatoma auris* is met with.

At the end of the first stage a remission may in some cases make its appearance and last for months, the mental health being apparently almost normal or exhibiting merely slight feebleness. Remissions are of varying degrees of completeness, and are generally associated with obesity.

In the **Second Stage** of the disease the physical signs become more marked and the speech more and more incomprehensible. The tongue, perhaps, cannot be protruded at all, or only for a moment. The appetite may be voracious, and the manner of eating gross and gluttonous; mastication is imperfect, and deglutition may be almost impossible from anæsthesia of the pharynx, the result being that food passes into the larynx. The face becomes more expressionless, the gait feebler, and the action of the hands still more impaired.

The general condition of the patient becomes worse. Having been perhaps unduly fat towards the end of the first stage, or after the cessation of the initial excitement, or during a remission, he now wastes again, and becomes cachectic. He may bruise easily, or suffer from *hæmatoma auris*, or be subject to abscesses of large size, or to carbuncles. Hæmaturia, melæna, and diarrhœa are all at times met with.

Epileptiform, apoplectiform, or paralytic seizures are now more apt to make their appearance, and in one of them death may occur. Varying degrees of paralysis, from slightly increased weakness of one arm or leg to definite hemiplegia or to general flaccidity of the limbs, are associated with these attacks, which are usually accompanied by a marked rise of temperature. The paralysis may be temporary or permanent, or end in coma. Consciousness may be retained during the fit. The patient

now leads a merely vegetative existence; he has to be washed, dressed, and fed like a child, and, if he be an inmate of an asylum, his dirty habits prevent him from associating with any but those suffering in a similar way. Bed-sores may form if not carefully guarded against, and there is a tendency to gangrene, resulting from the low state of the general nutrition.

The mental condition in this stage is one of marked dementia, the memory being almost entirely gone, and the patient utterly unable to care for himself; but even the most demented cases may still chatter vaguely about "millions" when their speech is almost incomprehensible, and there may be a constant restlessness, leading them to destroy their clothing or bedding. In some cases markedly hypochondriacal ideas are present.

There is in this stage great diminution of visual and auditory power and failure of common sensibility, pain being apparently only slightly felt. Patients in this state will, however, occasionally present for a few hours an amelioration of their condition, there being a temporary recovery of memory and other powers.

In the **Third Stage** the extreme of mental and physical deterioration is reached. The patient is bedridden, cannot stand or do anything for himself, flexion of the limbs with rigidity makes its appearance, the reflexes, superficial and deep, tend to disappear, the mouth opens mechanically at the approach of a spoon or any other object, and there is constant dribbling of urine and incontinence of feces. The patient grinds his teeth, he may never attempt to speak, his limbs waste, he may suffer from bed-sores, and, if not carried off in a fit, he may die of some lung, intestinal, or bladder complication, or from simple exhaustion. The bones are frequently extremely brittle from diminution of the earthy constituent and increase of fatty material, and hence fracture of the ribs may easily occur from any slight violence, and perhaps give rise to pyæmia or pleural inflammation.

Duration.—Severe acute cases may end in death in a few weeks; the average duration of most cases, however, from the time of recognition of the disease is, roughly, between two and three years. If, however, all the so-called prodromal symptoms be included as a part of the attack, the average duration will be found to be longer. Some cases last as

long as ten or fifteen years, but this prolonged duration is very rare. The average duration is longer in females than in males, in quiet demented cases than in those with excitement, and in those with hereditary tendency than in those without.

Diagnosis.—General paralysis in its onset is frequently overlooked; the moral perversions, though noticed, are not considered sufficient evidence of the presence of disease. A change of character in a man of middle life, especially if he has been an active, hard-working individual, should always excite the suspicion that general paralysis is impending, but the diagnosis cannot positively be made till the onset of the characteristic symptoms.

From ordinary acute mania or other forms of insanity the diagnosis is often difficult in the early stages, but is made certain by the occurrence of motor symptoms. In senile cases there is a resemblance in some respects to ordinary senile dementia, as in both there may be croticism, extravagance, loss of memory, and fits, but in the latter there is but little tendency to generalized paresis. Localized paralyses or hemiplegia are of more common occurrence.

Acute mania from alcoholic excess may resemble general paralysis at the onset, especially if associated with exaltation and tremors. Time alone will show the real nature of the case.

Syphilitic disease of the brain or meninges may simulate the demented form of general paralysis. In the former the cranial nerves are more often affected, and optic neuritis or other signs of localized disease may be present, whilst the characteristic affection of the tongue and lips is wanting. There are cases, however, of general paralysis in which the onset of the disease has been preceded by signs of cerebral syphilis with local palsies, and in which it would appear that syphilis has really acted as a cause.

From monomania of grandeur, general paralysis is diagnosed by the affection of speech and other motor symptoms, by the more changeable nature of the exaltation, and by the course of the disease.

Intra-cranial tumours sometimes give rise to symptoms simulating the demented form of this disease.

Further, it may be mentioned that disseminated sclerosis, dementia associated with hemiplegia or other paralyses and paralysis agitans may possibly be confused with general paralysis.

True epilepsy is said to be never fol-

lowed by general paralysis; but the onset of the latter disease is frequently marked by an epileptiform seizure, or there may be a series of these, so that for a time the diagnosis from epilepsy may be uncertain. The occurrence of the characteristic motor signs will decide the question. Epileptiform attacks occurring in the course of this disease are frequently associated with a rise of temperature.

Plumbism and the excessive use of the bromides may also give rise to conditions simulating general paralysis.

Prognosis.—General paralysis ends almost invariably in death, but some cases, according to Mickle, pass into a chronic weak-minded condition with arrest of the characteristic motor signs of the disease. Finally, a few cases have been recorded in which the patient recovered and remained well for years; in some of these the improvement dated from the supervention in the course of the disease of local inflammations, acute febrile disorders or injuries.

Pathology.—General paralysis may be regarded as the result of over-activity of the nervous system. This, in the first place, usually induces hyperæmia of the cerebral cortex, followed by exudation from the vessels, degeneration of the nervous elements, and their replacement by embryonic or connective tissue. There is considerable difference of opinion as to whether the disease should be regarded as of an inflammatory or degenerative nature, but the two processes go on concurrently, and are probably to a great degree mutually dependent. In rare cases the disease commences in the spinal cord, with symptoms either of locomotor ataxy or lateral sclerosis, and the brain appears to be secondarily affected; but, however it may begin, the whole of the nervous system eventually becomes involved.

Morbid Anatomy.—The most common changes are—(1) thickening of the dura mater, with perhaps evidence of hæmorrhagic pachymeningitis and opacities of the arachnoid. The latter appearance is generally present in advanced cases, and with it there is excess of sub-arachnoid fluid from wasting of the subjacent convolutions, hyperæmia, and thickening of the pia mater, which, in the great majority of cases, is adherent in scattered patches to the summits of the convolutions, the cortex being often torn in the attempt to peel off the membrane. (2) The cerebral cortex is irregularly wasted, and presents areas of hyperæmia or anæmia. The

atrophy is chiefly noticeable in the frontal and parietal regions, where in places the grey matter may be almost indistinguishable. (3) The interior of the brain may show alteration of consistence, either in the form of induration or softening. The ventricles are frequently much distended, and the ependyma covered with minute pearly granulations. The ganglia at the base are usually somewhat softened or wasted. The cerebellum also is generally somewhat soft. (4) In the spinal canal, meningeal changes may be found similar to those in the skull, and small calcareous plates are occasionally seen upon the arachnoid. The cord is often very soft or atrophied; but, on the other hand, definite sclerosis may be found in either the posterior or lateral columns, or in both. The grey matter is frequently diminished in quantity and pale in colour, or there may be local wastings. The nerves of special sense and the spinal nerves may also show atrophy. (5) The blood-vessels may present atheromatous or syphilitic changes, and hæmorrhage into the brain is occasionally met with. *Microscopically*, there are found distortions, thickening, and distension of blood-vessels, with proliferation of the nuclei, especially of the outer coat, and increase in size of the perivascular spaces, with exudation of leucocytes. In the vessel walls there are frequently molecular or pigmentary deposits. The neuroglia is found to be thickened and hypertrophied—changes leading to the formation of patches of sclerosis. The nerve cells show granular fatty, or pigmentary degeneration; they are altered in shape, and have lost their processes and undergone atrophy. Similar appearances are often found in the spinal cord.

Etiology.—One cause alone is rarely sufficient to give rise to general paralysis, there being almost invariably a combination of several. The following are the most important:—

(1) Sex. The disease is about four times as common in males as in females. (2) Age. The disease is most common between the ages of thirty and fifty-five years, the period of life most subjected to severe strain, although cases have been reported at the early age of fifteen, and also when the patient was over seventy. (3) Heredity is a predisposing cause in some cases, but in a less proportion than in other forms of insanity, and would appear to be a more frequent factor in females than in males. (4) The great majority of general paralytics

are married. (5) Occupations or conditions of life involving great physical or mental strain and emotional disturbance with insufficient rest for repair. The lower classes are more frequently affected than the upper. Pecuniary difficulties and other adverse circumstances are frequent and potent factors in the ætiology of the disease. (6) Intemperance in drink. (7) Sexual excess, which, although considered by some authorities to be almost the sole cause, probably rarely acts alone, and cases are frequently seen in which the complete absence of this cause can be established. Sexual excess as a symptom in the early stage may be mistaken for a cause. (8) In some cases general paralysis has followed directly upon an injury to the head; while, in others, an injury has appeared to act merely as a predisposing cause. (9) Syphilis. (10) Lead poisoning. (11) Excess in the use of tobacco has been considered as the exciting cause in some cases.

Treatment.—The disease is practically incurable when once the characteristic symptoms have developed. In the very earliest stage, when the patient is conscious of an impending break-down, a complete cessation from all causes of emotional or mental strain might act beneficially, but he is usually regarded as hypochondriacal by his friends, and, instead of rest, an attempt is made to stimulate him into cheerfulness. In most cases the patient is, however, unconscious of his condition, and will not allow that he needs rest. Hence, almost invariably removal to an asylum is sooner or later necessary. No drugs appear to have any effect in cutting short the disease. In syphilitic cases, however, appropriate remedies should be tried, although the results are not encouraging. In some cases a remission or arrest of the symptoms has followed the occurrence of an injury or a local inflammation, or the application of iodine to the spine. General paralytics are very susceptible to powerful drugs, and such should be used with great caution. The question of return to home when a remission occurs can only be decided by a full consideration of each individual case. Some have so complete an arrest of symptoms that it is difficult to retain them in an asylum as persons of unsound mind, but a return to home life frequently accelerates the final break-down, especially if followed by attempts at sexual intercourse or indulgence in any form of excess. R. PERCY SMITH.

GLANDERS (Farcy).—An infectious disease, of rare occurrence in man, and derived almost invariably by direct contagion from the horse, but capable of transference from one human being to another.

The virus of the disease may be received by inoculation through a cut or an open sore, or upon a mucous membrane. The period of incubation is short, lasting as a rule not more than four days.

Symptoms.—If there be a wound, it soon becomes inflamed, its edges puffy and surrounded by an erythematous blush, and there is a purulent discharge. The lymphatics in the neighbourhood become red and tender, and the glands enlarged. When the lymphatics are cord-like and nodulated (farcy buds), the disease is called farcy, but the two diseases are really identical. Languor and headache, aching pains in the limbs, nausea and vomiting, high fever, a frequent pulse, a dry skin, constipation followed by diarrhœa with fœtid motions, are the chief symptoms in the early stage. Generally within a week of the onset of the disease bright red points or papules, surrounded by a yellowish or erysipelatous blush, appear on the face, nose, cheeks, or about the joints. These are soon converted into flat vesicles or bullæ, varying from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. They become depressed in the centre, soften, and form abscesses, which burst, giving exit to a thick sanious pus, and leaving unhealthy-looking ulcers with everted edges.

An important, though not an early or constant, symptom is the presence of a viscid discharge from the nostrils, streaked with blood. The nose becomes blocked with crusts, and is swollen externally; necrosis of the septum often results, the discharge being then purulent and offensive. The patient generally has cough, with blood-stained sputa. Rigors are not uncommon, and delirium and coma usher in a fatal termination.

The disease may occur in an acute or a chronic form. In the acute form it is very fatal, death usually occurring within two weeks, and often much sooner. In the chronic form the symptoms are similar, but are evolved more slowly. The patient becomes emaciated and cachectic, and may die in the course of three or four months, or he may ultimately recover after a protracted and tedious illness.

Ætiology and Pathology.—There are

good grounds for the belief that glanders is due to the presence of a micro-organism. A bacillus, about the size of the tubercle bacillus, but thicker and mobile, has been discovered in the nodules of equine and human glanders, and it has also been proved that the inoculation of horses, rabbits, and guinea-pigs with the cultivation products is followed by the development of a disease presenting ulcers and nodules similar to those occurring in glanders, and that the bacillus is present in the blood, urine and organs of the inoculated animals.

Morbid Anatomy.—After death, nodules, hard or purulent, according to the stage of the disease, may be found in the lungs, liver, spleen, and in the brain and its membranes. The joints often contain pus; the bones also may be affected. Hæmorrhagic abscesses are often found in the muscles of the limbs, abdominal walls, and intercostals, a condition which has been regarded as characteristic of the disease.

Treatment.—If the patient be seen sufficiently early, it would be proper to cut out or destroy with caustics the wound through which the inoculation took place. Abscesses should be freely drained as soon as possible, under antiseptic precautions. Antiseptic remedies, such as quinine or mercury, may be given internally, and a liberal supply of stimulants with a nourishing diet.

JOHN ABERCROMBIE.

GLANDULAR HYPERTROPHY.—This term is used when a lymph gland is found to be enlarged and no direct cause for the enlargement can be assigned. When glands have been inflamed and remain enlarged for long periods without undergoing much alteration, they are sometimes spoken of as being in a condition of "simple hypertrophy." It is possible that lymph glands may undergo a true physiological hypertrophy from having an unusual amount of work to do, as the converse atrophy from disuse is known to occur both as a senile change and as the result of the removal of the tributary lymphatic area—for example, the amputation of an arm or a leg.

In lymphadenoma, the axillary or femoral glands undergo hypertrophy; in one form of leucocythæmia, and in some forms of lymphosarcoma, if a gland be excised and examined, sometimes only a simple increase in the normal constituents is found, and it is to the enlargement of the lymph glands found in these diseases that

the term hypertrophy is most often applied. There can be little doubt, however, that in the subjects of these diseases there is some general constitutional change, although the nature of it is at present undetermined. The state of the glands in the above-mentioned diseases will be found described under the appropriate headings (*see* LYMPHADENOMA; LEUCOCYTHÆMIA; LYMPHOSARCOMA; *also*, LYMPHATIC SYSTEM, DISEASES OF).

FRANCIS G. PENROSE.

GLOBUS.—The sensation of a ball rising in the throat, a symptom commonly complained of by hysterical women.

GLOSSO-PHARYNGEAL NERVE, Diseases of the.—This nerve supplies motor branches to the stylo-pharyngeus muscle and to the middle constrictor of the pharynx, but it does not supply—at any rate in the monkey—the levator palati, as that muscle receives its motor supply from the accessory nerve to the vagus. The glosso-pharyngeal is also the nerve of taste for the posterior part of the tongue and the soft palate, and it also supplies sensory nerves to those parts and to the upper portion of the pharynx.

Symptoms.—Paralysis due to disease of the nerve itself is of very rare occurrence. It may result from syphilis, meningitis or diphtheria. The symptoms are loss of taste at the back part of the tongue, and some difficulty in swallowing, with anæsthesia about the fauces. The nucleus of the glosso-pharyngeal nerve can hardly be diseased without the vagus, spinal accessory, and hypoglossal nuclei being also involved. In bulbar paralysis the motor part only of the glosso-pharyngeal nucleus is, as a rule, affected, along with the other motor nuclei (*see* BULBAR PARALYSIS). It is often difficult to separate the symptoms due to paralysis of the glosso-pharyngeal nucleus from those resulting from the destruction of the other nuclei.

Treatment.—No special treatment need be described, as the diseases of which this affection forms a part are discussed in detail under their respective headings.

C. E. BEEVOR.

GLYCOSURIA.—A condition in which grape-sugar is present in the urine.

Other forms of sugar are occasionally observed. Lactose has been detected in the urine of nursing women, and levulose and inosite or muscle-sugar sometimes occur, but for the recognition of these

forms the sugar must be first separated from the urine; the ordinary tests do not distinguish these bodies from grape-sugar, and for practical purposes this is unnecessary.

Detection of Sugar in the Urine.—Grape-sugar has the power, in the presence of an alkali, of reducing solutions of several metallic salts, so as to throw down an insoluble sub-oxide of the metal or even the metal itself. This reaction is made use of clinically for the detection of grape-sugar.

(1) *Trommer's Test.*—To a quantity of urine a few drops of a solution of copper sulphate are added, and afterwards an excess of liquor potassæ. The mixture is then boiled, and the presence of sugar is shown by the precipitation of a red sub-oxide of copper.

Fallacies of Trommer's Test.—The liquor potassæ may on boiling cause the urine to become of a very dark colour, so that the precipitation of the sub-oxide of copper cannot be seen. If too much copper sulphate be used, the addition of the liquor potassæ causes the deposit of black oxide of copper when no sugar is present, and so invalidates the test. For these reasons it is desirable to have the proper proportions of alkali and copper already prepared in a test solution.

(2) *Fehling's Test.*—Fehling's solution, which meets the necessity just referred to, has the following composition:—Crystallized sulphate of copper 34.64 grms., tartrate of soda and potash 173 grms., solution of caustic soda (sp. gr. 1.12) 480 c.c., water sufficient to make 1000 c.c. Of this solution a quantity is taken sufficient to form a column nearly an inch in height in a test-tube. This must now be boiled before urine is mixed with it. The test solution is prone to decompose on keeping, and then when boiled will deposit the sub-oxide of copper before the addition of the urine. If the solution remain clear on boiling, a few drops of the suspected urine are added to it, when, if a large amount of sugar be present, the mixture becomes of a yellow colour, and in a short time deposits the sub-oxide of copper as a yellow or red precipitate. If no change be observed, more urine must be poured in, but never so much as to exceed the amount of test solution employed. The mixture is again heated until it just boils, but no longer, and is then allowed to cool slowly. If sugar be present, the sub-oxide is thrown down as a yellow or red deposit, or, if there be only a small

amount of sugar, merely a greenish milkiness is produced.

Fallacies of Fehling's Test.—Sir William Roberts has pointed out that it is essential that the test should be performed exactly in this manner to avoid several sources of error. His work on Renal Diseases may be consulted for details. It need only be stated here that an excess of sugar will prevent the precipitation of the sub-oxide; that the alkali of the test precipitates the earthy phosphates from the urine, and these may be confused with the sub-oxide; that uric acid and other substances reduce the copper solution, even if no sugar be present; and that all these fallacies are avoided if the test be performed with strict attention to details.

The liability of Fehling's solution to decompose may be obviated to a great extent by keeping the copper sulphate and the alkali in separate solutions of due strength, to be mixed in equal quantities at the time of testing, or by enclosing the solid ingredients in india-rubber or the fluid in glass capsules.

(3) *Pavy's Test.*—Dr. Pavy's ammoniacal copper solution, depending upon the same reaction, is employed in the same manner. In the opinion of the writer it is more useful for quantitative testing, and its composition and uses are given later in this article in the description of the mode of estimating the amount of sugar in the urine.

(4) *Mulder's Test.*—A solution of the sulph-indigotate of soda is added to the urine, and the mixture rendered alkaline by carbonate of sodium. The whole is then boiled, and, if sugar be present, the blue colour of the indigo is changed to a pale yellow. This is due to the reducing action of the sugar upon the indigo-blue, changing it to indigo-white. On standing for some time, and especially if shaken in contact with the air, the blue colour again returns.

The special recommendation of this test is that it can be rendered portable in the form of the test-papers introduced by Dr. Oliver. Separate portions of bibulous paper are soaked in solutions of sulph-indigotate of soda and of carbonate of soda, and afterwards dried. One of each of these papers is placed in a test-tube with a little water, and a blue solution is obtained. To this a drop of urine is added, and the mixture boiled. If sugar be present, the blue colour is gradually changed into a yellowish tint, passing through shades of red and violet.

(5) *The Picric Acid Test.*—A solution of picric acid, boiled with liquor potassæ in the presence of grape-sugar, is reduced to picramic acid, and the yellow colour of the original solution is changed to a deep red. This test has been introduced by Dr. George Johnson for the detection of grape-sugar in urine.

A small quantity of a saturated solution of picric acid is placed in a test-tube, and an equal part of liquor potassæ is added. About the same quantity of the urine to be tested is poured into the mixture, and the whole is boiled. A deep-red colour indicates the presence of sugar.

(6) *Phenylhydrazin Test.*—Phenylhydrazin has the power of forming with grape-sugar a yellowish crystalline compound, with difficulty soluble in water, and called phenylglukosazon. This reaction is made use of for the detection of sugar in urine, and has been specially recommended by von Jaksch.

Two parts of phenylhydrazin and three parts of acetate of soda are placed in a test-tube, which is then half filled with water. The test substances may be conveniently measured by the amount which will lie upon the point of an ordinary penknife. The solution is slightly warmed, and the urine to be examined is added until the tube is full. It is now placed in a vessel of boiling water for fifteen to twenty minutes, and afterwards allowed to cool by standing in a beaker of cold water.

If much sugar be present in the urine, a yellow crystalline precipitate forms at once, and under the microscope is seen to consist of yellow needles. If only a small quantity of sugar be present, it is well to place the mixture in a conical glass, and examine microscopically the yellow deposit which may form. The test is not interfered with by the presence of albumen.

(7) *Moore's Test.*—This, which is one of the older tests, is not to be recommended, as it is not sufficiently delicate, and is also very liable to fallacies. The urine is boiled with an equal quantity of liquor potassæ, when, if sugar be present, the fluid will assume a dark-brown tint.

Fallacies of Moore's Test.—Many urines which do not contain sugar give a brown coloration with liquor potassæ when boiled, and this is especially the case when, as often happens, the liquor potassæ has absorbed lead from the bottles in which it has been kept.

(8) *The Fermentation Test* is not suffi-

ciently delicate for qualitative testing, though in a modified form it may be made use of with advantage for estimating sugar (see under *Volumetric Methods*). There are certain other tests known, such as the bismuth test, the naphthol and thymol tests, the acetate of lead test, and the diazo reactions, which are not to be recommended for clinical purposes, by reason either of their extreme liability to fallacies or to their being too complicated for easy application.

Estimation of the Amount of Sugar in the Urine.—A rough idea of the quantity of sugar in a diabetic urine may be obtained from the density of the urine—the higher the density, the greater the amount of sugar present. This rule, however, can only apply when large quantities of urine are passed and the secretion resembles a solution of grape-sugar in water. A specific gravity of 1030 and upwards should then excite the suspicion that sugar is present. It has been pointed out by Sir William Roberts that the relation between the density and the quantity of sugar is by no means constant in urine in which the natural ingredients are present in greater proportion than normal, as is the case when only a small quantity is being excreted. Even for clinical purposes more accurate methods are required, and of these the following may be specially mentioned:—

(1) **Volumetric Methods.**—Three methods are made use of for estimating the quantity of sugar volumetrically.

(a) *Fehling's Method.*—The composition of Fehling's solution has already been given. Ten cubic centimetres of the solution contain as much copper as is reduced by 0.05 gm. of grape-sugar. Of the urine to be examined 10 c.c. are placed in a burette and diluted with water to 100 c.c. Ten cubic centimetres of Fehling's solution are placed in an evaporating dish, diluted with about twice or thrice the volume of water, and boiled. The diluted urine is then added to the diluted Fehling's solution drop by drop, and the fluid is boiled and stirred after each addition. This is done until all the blue colour is discharged from the copper solution, when the number of cubic centimetres of urine which have been added is read off from the burette. To determine more accurately the end point of the reaction, when the suspected stage is reached some of the test fluid may be filtered. A portion of the filtrate is acidified with acetic acid, and a solution of ferrocyanide of potassium added. A brown precipitate indicates that copper

is still present, and that not enough urine has been used. On the other hand, if to another portion of the filtrate a few drops of Fehling's solution be added, and a precipitate of oxide of copper obtained on boiling, too much urine has been used. In either case the estimation must be repeated from the beginning.

The quantity of Fehling's solution originally employed represents 0.05 gm. of sugar in the urine used to reduce it. The number of c.c. drawn off from the burette, when divided by 10, gives the quantity of urine taken, since this was diluted ten times. The percentage of sugar in the urine will be obtained by multiplying 0.05 by 100 and dividing by the number of cubic centimetres of urine used. Thus, if 12 c.c. of diluted urine were used, this would represent 1.2 c.c. of the original urine, which would contain 0.05 gm. of sugar. The percentage would be obtained from the proportion—

$$1.2 : 0.05 :: 100 : x \therefore x = \frac{100 \times 0.05}{1.2} = 4.16$$

(b) *Pavy's Method.*—The end point of the reaction with Fehling's solution is difficult to determine, by reason of the precipitated oxide of copper interfering with an observation of the colour of the solution. Dr. Pavy has therefore suggested the employment of an ammoniated copper solution wherein the ammonia retains the copper oxide in solution after reduction has taken place. The blue colour of the solution is discharged by sugar, but no precipitation of copper oxide takes place. This solution also is much more stable than Fehling's solution. Pavy's solution is made thus:—Copper sulphate 4.158 grms., tartrate of soda and potash 20.4 grms., caustic potash 20.4 grms., strong ammonia (sp. gr. 0.88) 300 c.c., water to 1000 c.c. Of this solution 10 c.c. are decolorized by 0.005 gm. of sugar. The solution is made by dissolving the tartrate of soda and potash in one portion of water, and the sulphate of copper in another portion. The solution of sulphate of copper is poured into that of the potash salts, the ammonia is added, and the whole diluted with the required amount of water.

The solution can be carried in glass tubes, each containing 10 c.c. The solid materials for the test may also be carried in the form of pellets, one containing caustic potash, another the copper sulphate and tartrate of potash, together with ammonium chloride. The pellets are dissolved separately, and the solu-

tions when mixed represent 10 c.c. of the test solution.

Into a small flask are placed 10 c.c. of the solution diluted with 20 c.c. of water. A burette is filled with the urine to be examined, diluted to 1 in 20. The burette and flask are to be connected, so that air is excluded from the flask, and now the test solution is heated to boiling. The urine is run into it drop by drop until the whole of the blue colour is discharged. The number of cubic centimetres of the diluted urine used divided by 20 gives the number of cubic centimetres of the original urine containing 0.005 grm. of sugar. The reason for excluding air from the flask is that the solution, when decolorized, rapidly absorbs oxygen from the air and resumes its blue colour.

In Dr. Pavy's original paper (*Lancet*, vol. i. 1884, p. 376)—which may be consulted for further details—a table is given of the amount of sugar per 1000, corresponding to the different number of cubic centimetres of urine employed.

(c) *Johnson's Method*.—Dr. George Johnson has applied his picric acid test for sugar to the volumetric estimation of sugar in urine.

By the action of sugar in the presence of liquor potassæ, a yellow solution of picric acid is reduced to a red solution of picramic acid, and the depth of the red colour produced can be made a measure of the amount of sugar present in the urine. A standard solution of picramic acid is required, with the colour of which the results of the reaction can be compared. This, it is found, may conveniently be such as would correspond to $\frac{1}{4}$ grain of sugar to the ounce of urine. The colour of picramic acid, however, rapidly changes on exposure to light; therefore a solution of acetate of iron is employed equal in colour to the standard picramic acid solution, and made according to the following formula:—Liq. ferri perchlor. fort. (sp. gr. 1.338) 1 drachm; liq. ammon. acetat. (sp. gr. 1.017) 4 drachms; glacial acetic acid (sp. gr. 1.065) 4 drachms; liq. ammoniæ (sp. gr. 0.959) 1 drachm; distilled water to 4 ounces. The urine to be examined is diluted to five or ten times its volume. A drachm of the diluted urine is boiled for sixty seconds with 30 minims of liq. potassæ and 40 minims of concentrated solution of picric acid, sufficient water being added to make 4 drachms of the solution. After boiling, the solution should, if necessary, be diluted with water to make its volume again equal to 4 drachms. The boiling

is best performed in a long test-tube marked at the height of 4 drachms.

The deep-red solution must now be diluted until its colour exactly equals that of the standard solution. This is done in a stoppered tube 12 inches long and $\frac{3}{4}$ inch in diameter, graduated into tenths and one-hundredths; attached to it is a smaller tube containing the test solution. The boiled mixture of urine and test is poured into the larger tube up to the height of one of the tenth divisions, and it is then diluted with distilled water until its depth of colour is exactly equal to that of the test solution. The number of degrees of dilution is then read off.

During the boiling the 1 drachm of urine taken was diluted to 4 drachms; consequently, if the diluted solution after boiling had equalled in colour the test solution, the original urine would have contained 1 grain of sugar to the ounce. If further dilution were required to bring it to this standard, say from ten to thirty-five divisions, 3.5 grains of sugar to the ounce would be indicated. But at the beginning the urine was diluted, say, ten times. Therefore the result above obtained must be multiplied by 10 to give the amount of sugar present in the original urine. A fuller account will be found in Dr. George Johnson's work on "Albumen and Sugar Testing."

(2) *Differential Density Method*.—

When yeast is added to a urine containing sugar, fermentation is set up, and, as the result of the destruction of the sugar and the production of alcohol, the urine loses in specific gravity. Sir William Roberts has based on this phenomenon a method of estimating the amount of sugar in a urine by comparing the specific gravity before, with that after fermentation. He has shown that every degree of specific gravity lost in the process corresponds to 1 grain of sugar per ounce in the urine examined, and, by means of a urinometer with a sufficiently lengthy stem, a difference of half or even a quarter of a degree may be noted.

About 4 ounces of the saccharine urine are put into a 12-ounce bottle, and a lump of German yeast about the size of a cob-nut or small walnut is added to it. The bottle is closed with a nicked cork, to allow of the escape of carbonic acid, and put in a warm place to ferment. Beside it is placed, for comparison, a tightly corked 4-ounce bottle filled with the same urine, without yeast. At the end of twenty-four hours the specific gravities of the two specimens are taken

and compared, and the "density lost" ascertained. It is well, two or three hours before doing this, to remove the urines to a cool place, so that they may attain the same temperature as the atmosphere.

The percentage of sugar in the urine may be obtained by multiplying the number of degrees of density lost by 0.23. This method is very accurate, easily carried out, and, although a delay of twenty-four hours is required before the result can be known, the actual time consumed in the necessary operations is very little.

(3) **Polarimetric Method**—Glucose turns the plane of polarized light to the right, and, if a urine containing this sugar be examined by the polariscope, the number of degrees through which the polarized beam is diverted may be taken as a measure of the amount of sugar present. The instruments used for this method of estimation are those of Mitscherlich, Soleil, or Rothe.

The determination is, in practised hands, very rapidly performed, but it is liable to fallacies. Levulose occurs sometimes together with glucose in pathological urines, and in diabetic urines β -oxybutyric acid is frequently found. Both these bodies turn the plane of polarized light to the left, in the opposite direction to glucose, and so neutralize, to a certain extent, the action of the latter. The delicacy of this method is greatly increased by estimating the polariscopic deviation before and after fermentation, as recommended by Hoppe-Seyler and others. The necessary instrument is expensive, and the operator must be expert in its use, so that this method is scarcely adapted for clinical purposes.

Symptomatology.—It has been shown that sugar may be found, albeit in extremely small quantities, in most normal urines. It may occur in larger amounts as a temporary constituent of the urine in a great variety of conditions. The urine of nursing women, especially, when after the child is weaned, the secretion of milk continues plentiful, has been found to contain lactose, and the urine of the sucking child occasionally contains the same substance. In the course of certain of the specific fevers, in asphyxia, after poisoning by morphine, curare, carbonic oxide, nitrite of amyl, and other compounds, and in the course of heart, lung, and kidney diseases, sugar may appear in the urine.

In connection with some affections of

the nervous system, such as epileptic attacks, concussion of the brain, cerebral hæmorrhage or tumour, especially when these lesions have been situated in the neighbourhood of the fourth ventricle, glycosuria has been noted as a transient phenomenon.

In all these conditions, however, the glycosuria is only temporary, yet there are other cases in which sugar may be a permanent constituent of the urine, and yet the general health may be scarcely, if at all, affected. Such a simple glycosuria is prone to occur in persons beyond middle age who partake freely of sugar or amylaceous substances; also in the obese and in those of gouty tendencies. The condition has been noted in connection with constitutional syphilis, and Dr. Ord has described its occurrence together with attacks of angina pectoris. Moreover, in a certain number of cases, it appears to be hereditary. There may accompany the glycosuria some degree of polyuria, a little thirst and some muscular weakness, and the liver too may present a notable enlargement, but not uncommonly all these symptoms are absent. The wasting and other signs of true diabetes do not occur; the affection may last for years without causing more than very slight distress to its subject, and is not, in itself, dangerous to life.

The *pathology* of glycosuria has necessarily been discussed in treating of diabetes mellitus. In most of such cases as are referred to here, the glycosuria is probably due to the sugar from the intestine escaping detention in the liver and transformation into glycogen. Such escape may be caused by so copious an ingestion of sugar-forming substances that the liver is incapable of dealing with them. But in some cases no such error of dietetics can be traced. There the liver, or possibly one of the other glyco-genic tissues, is in fault. Dr. Ord has suggested that high arterial tension in one part of the body may be compensated for by a dilatation of vessels in some other part, say in the liver, and that thus glycosuria may be induced. This would explain the occasional association of glycosuria with angina pectoris and granular kidney.

Treatment.—If the condition be slight, no treatment whatever is needed. If more pronounced, and the patient be at all distressed by thirst, the adoption of a not too rigorous diabetic diet, as already described, and with this the administration of alkalies and salicylate

of soda, will suffice to keep the disorder in check. (See DIABETES MELLITUS.)

ROBERT MAGUIRE.

GONORRHOEA IN THE FEMALE consists chiefly in an acute vaginitis, but the urethra is generally also inflamed.

Symptoms.—The disease is marked by a copious discharge of pus, and by injection of the vagina, which is especially noticeable on the tops of the rugæ, where there may be slight erosions. It is not possible, from the evidence of the unaided senses, to distinguish vaginitis of gonorrhœal origin from vaginitis not so caused. We can only judge by the greater severity and the suddenness of origin of the gonorrhœal inflammation.

Complications and Sequelæ.—The inflammation may spread down the ducts of Bartholin's glands, and produce supuration of these glands, a labial abscess, or, short of this, the inflammation may persist in the ducts, the openings of which will be seen to be reddened, and out of them pus can be squeezed. The treatment of this complication is to pass a fine director (a lachrymal director will answer the purpose) down the duct, and slit it up, and then cauterize the exposed surface with nitrate of silver.

The inflammation may spread to the cervix uteri, and cause cervical endometritis; or, further, to the body of the uterus, and thence along the Fallopian tube to the peritoneum. It may thus cause peri-oophoritis, or even abscess of the ovary. The salpingitis may be suppurative, and the pus may escape into the peritoneum through the tube, and peritonitis, first local, then general, may follow; or the tube may become distended with pus, its end having been closed by inflammation. The tube may ulcerate through or burst, and peritonitis be set up. The pus may, however, be retained for months or years, and undergo inspissation. In that case the disease will be the cause of persistent suffering, and a source of danger. The pain may diminish in time, but the affection can only be cured by the removal of the diseased tube.

If the vaginitis be left untreated, or be improperly treated, chronic leucorrhœa may last for years, just as a gleet does in the male sex. How long it remains infectious has not been determined.

The urethritis may lead to stricture, as it does in the male, but this is not a frequent consequence in the female;

or the inflammation may spread to the bladder, and cystitis be the result.

Gonorrhœa, when very acute, and the patient leading an active life, may lead to bubo—*i.e.*, inflammation and possibly supuration of the inguinal glands.

It must not be forgotten that a woman may have a discharge which, although not gonorrhœal, may cause urethritis in the male.

Pathology.—Recent investigations have gone far towards showing that gonorrhœa is due to a specific organism, the "gonococcus"; but the difficulty in distinguishing this coccus from others is so great that our knowledge of this microbe cannot yet be said to have reached the stage of clinical utility.

The treatment consists in rest in bed, the administration of laxatives, the avoidance of alcohol, and the frequent use of mild astringent injections, such as chloride of zinc gr. $\frac{1}{2}$ -j ad $\overline{3j}$, or tannic acid gr. iiij-vj ad $\overline{3j}$, or corrosive sublimate i in 1000 or i in 2000. Weak injections, frequently repeated, answer better than strong injections given at longer intervals; but if the patient cannot be persuaded to use the mild injections often enough, stronger may be prescribed. Before the astringent fluid is used, clean water should be injected to wash away the discharge present in the canal. If the patient will submit to thorough treatment the disease can generally be cured in about six weeks. But as, when limited to the vagina, it causes only slight inconvenience to the patient, it is too often the case that she either does not seek treatment, or will not submit to the restraint and trouble which thorough treatment involves; and, therefore, the secondary results of imperfectly cured gonorrhœa are far from uncommon.

G. E. HERMAN.

GOUT (Podagra, affecting the foot; Cheiragra, the hand; Gonagra, the knee).—The word "gout" is derived from the Latin *gutta*, a drop, from the ancient belief that the malady depended on a poison which distilled drop by drop into the diseased joints.

Gout is a constitutional disease, hereditary or acquired, apparently dependent upon an excessive production and accumulation of uric acid within the system, attended by the deposition of urate of soda in the various fibrous and cartilaginous tissues of the body, but especially within and about the joints, and characterized, in the acuter forms of the malady, by recurrent attacks of articular

inflammation, the smaller joints being primarily and chiefly affected.

Symptoms and Varieties.—Gout may be *regular*—i.e., articular, affecting the joints; or *irregular*, a form which comprises (a) visceral gout, in which symptoms referable to internal organs may develop independently of any joint affection, or appear rapidly upon the sudden subsidence of the joint inflammation—i.e., *retrocedent* gout—or seem, variously grouped, to take the place of what would otherwise have been a normal repetition of the gouty arthritis usual to the patient—i.e., *suppressed* gout; and (b) cutaneous gout, including the several forms of skin disease which are common, and have a special pathological significance, in gouty subjects.

Each of these varieties of gout, regular and irregular, may exist in either an *acute* or in a more or less *chronic* form.

1. **Acute articular gout** is commoner in males than in females, appears usually between thirty and forty years of age, is very rarely experienced before twenty, and then only when the hereditary predisposition is strongly marked. First attacks are rare after fifty, and exceptional after sixty-five years of age.

A first attack is frequently, but not always, preceded by recognizable premonitory symptoms; subsequent attacks, however, are almost invariably ushered in by certain prodromata, such as dyspeptic symptoms, flatulence, heartburn, constipation, or irregular diarrhoea. There may be cardiac oppression or palpitation; attacks of asthma, bronchitis or of sore throat, associated with a peculiar velvety appearance of the faucial mucous membrane. Drowsiness, vertigo, disturbed sleep, irritability of temper, neuralgic pains and cramps, are common prodromal symptoms. The urine often appears unduly concentrated, high-coloured and scanty, depositing lithates on cooling. Sometimes the attack is immediately preceded for a day or two by a feeling of unusual well-being; or occasional twinges of pain may be experienced in some of the smaller joints of the foot or hand.

A few hours after midnight the patient wakes with pain in the ball of one or other great toe. The local inflammation and its attendant pain rapidly increase until the latter becomes excruciating, and is intensely aggravated by the slightest movement. The joint appears swollen, with turgid superficial veins; the surface is hot, deep red in colour, tense and shining.

The general symptoms are in sympathy with the local disorder. Chills or even rigors occur, with more or less pyrexia; the pulse is frequent, the tongue furred, and there is loss of appetite, with thirst and constipation. The urine is scanty, abnormally acid, and throws down an abundance of amorphous urates, although the *absolute* amount of uric acid excreted during the twenty-four hours is below the normal. Sleep is prevented by pain and restlessness, and the temper becomes extremely irritable.

Towards morning—sometimes not until after the midnight following—the more acute symptoms subside. The exquisite tenderness of the inflamed joint gives place to a tolerable sense of aching tension, the skin begins to perspire, the temperature declines, and the patient, more or less exhausted, falls asleep. The joint, though less painful, appears more swollen, and is still red and tender, but its surface is more moist and less shining. The termination of the painful paroxysm may be marked by a critical discharge from the bowels or skin or by a very copious deposit of lithates.

This train of symptoms may be repeated with lessening severity for four or five days, or even for some weeks, and during this time other joints may be similarly attacked, contemporaneously or in succession. Finally, the “fit of gout” comes to an end, leaving the affected joint still swollen, oedematous and tender for a time, and the patient temporarily weakened in proportion to the severity of the attack, but often expressing himself as feeling better than he did before his illness. The articular inflammation, though apparently intense, never runs on to suppuration, and the joint or joints which were affected during the attack appear, after a while, to have completely recovered their normal appearance and mobility.

Very rarely does the first attack of acute articular (acquired) gout in the case of a male begin in any other than the metatarso-phalangeal joint of the great toe, and most commonly in the right foot. But other joints of the feet, and even of the hands, are sometimes the first to suffer; and recent local injury—e.g., a sprain or blow—may determine the primary development of gout in a joint, such as the knee, which usually escapes altogether during the earlier period of this disease. As the joint recovers its normal appearance, the superjacent skin undergoes free desquamation.

The first attack of acute gout is almost invariably followed by others, and that after intervals, the length of which depend mainly on the patient's habits and mode of life, but which tend inevitably to become shorter and shorter. With each successive attack other joints are apt to become implicated, and recurrent inflammations increase the stiffness and enlargement of those articulations which have already suffered upon previous occasions.

The duration of the attacks tends to increase in proportion with their greater frequency, and often the general symptoms grow *pari passu* in severity; while, as a rule, the more frequently any particular joint has suffered, the less acute are the local symptoms which it presents.

The second attack is rarely delayed much more than a year after the first; and though the rate at which the morbid process tends to successively affect the joints and the degree in which they suffer vary greatly in different individuals, the permanent joint-mischief which is established sooner or later gradually and imperceptibly merges into that more or less crippled condition which is conveniently distinguished as—

2. **Chronic Articular Gout.**—As urate of soda is deposited in increasing quantity in and about the affected joints, the articulations appear permanently enlarged, and gradually lose their mobility, while the surrounding ligaments, tendons and fasciæ become stiff, thickened and inflexible; hence the joints appear irregularly bulged and nodulated. The skin covering the joints may appear pallid or livid. Concretions of sodic urate (*chalk-stones*) are deposited, and, ultimately destroying the overlying skin by pressure, are apt to produce unhealthy ulcers, which discharge masses or particles of the salt, sometimes mingled with pus, and exhibit but little tendency to heal. Similar concretions or *tophi* may develop in or upon any cartilage or expanse of fibrous tissue, and are thus commonly observed in the helix of the external ear, about the alæ nasi, and along the edges of the tarsal cartilages, where they may give rise to obstruction of the tear duct, and subsequently to lachrymal fistula.

After the smaller joints of the hands and feet, the ankles, wrists, elbows, knees, shoulders and hips tend to suffer. In severe cases the disease may extend so as to involve all, or almost all, the articulations of the body, finally producing, in conjunction with the infil-

trated bursæ, ligaments, and tendons, an absolute crippling of all locomotive organs, with an appearance of extreme distortion and deformity. The recurrent attacks of localized gouty inflammation are less acute, but pain is rarely or never altogether absent, and is readily aggravated by comparatively trivial causes.

At the same time, the general symptoms of the malady increase in severity and frequency; some of those already mentioned under the head of premonitory symptoms are nearly always present in greater or less degree; the general health suffers in proportion, and the patient becomes flabby and enfeebled. Attacks of asthma or bronchitis are common, and may replace exacerbations of the joint-affection, and signs of cardiac degeneration and of circulatory failure are apt to develop.

The urine becomes abundant, pale and watery, of low specific gravity, and deficient in solids, especially in uric acid, which is now seldom deposited; at the same time albuminuria is apt to make its appearance in small quantity, and to be accompanied with hyaline or waxy casts. As the general health becomes enfeebled, crystals of oxalate of lime also are frequently to be found in the renal secretion. Cystitis, prostatitis, and urethritis are not uncommon; and symptoms dependent on interference with the functions of the brain and nervous system may also be developed. Hæmorrhoids are frequently a source of trouble, and in women menorrhagia may be profuse and may persist long after the normal climacteric age.

3. **Irregular Gout.**—Individuals who possess a gouty heritage frequently exhibit peculiar symptoms or groups of symptoms without suffering from any definite affection of the joints. No disease is more certainly hereditary than gout, and few are more truly atavic in order of succession; thus, the *daughters* of a gouty father may apparently escape; their *sons* are extremely apt to exhibit some manifestations of the disease. And, in a less marked degree, women tend to express in their own persons the gouty diathesis inherited from a paternal grandmother. Symptoms of "irregular" gout are also observable in the acquired form of the disease, and occur either between or in place of the "regular" paroxysms of joint-inflammation.

During infancy a proneness to night terrors, epileptoid attacks, enuresis, constipation or irregular diarrhœa, laryngis-

mus stridulus, bronchial catarrh and various forms of eczematous eruption is often indicative of an inherited gouty tendency. The milk teeth may decay rapidly, and the child exhibit other indications of "delicacy." Adenoid vegetations in the naso-pharynx, with their attendant complications, are far from uncommon.

In adolescents and adults various symptoms indicative of functional derangement of the digestive and respiratory organs, of the circulatory system (*e.g.*, repeated flushings, undue susceptibility to cold, phlebitis, and frequent "dying" of the fingers and toes) and of the brain and nervous system (*e.g.*, headache and sciatica), together with affections of the eye (attacks of "hot eye," scleritis, retinitis, and even of glaucoma), may appear.

The cutaneous manifestations of irregular gout mainly take the form of eczema and psoriasis, or of a condition resembling a combination of the two, and prurigo. An eczematous irritation about the anal and the vulval orifices is far from uncommon in middle-aged and elderly gouty subjects, and is often most distressing. Eczema and psoriasis are very apt to reappear about spring and autumn, and, while suffering from the skin affection, patients are commonly relieved more or less completely from the arthritic and visceral manifestations of gout. Erythema and urticaria are apt to be very readily provoked in some gouty persons.

The diagnosis is usually easy in acute cases. *Acute rheumatism* usually appears for the first time before the age of twenty, and exhibits a more gradual mode of invasion, and a different ætiological history. The size of the joints affected, their being less deeply reddened, the less excruciating pain, the profuse acid sweats, the shifting character of the arthritis, the usually high fever, the appearance of the tongue, the characters presented by the urine, and the liability to cardiac complications are usually obvious points in the differential diagnosis. *Pyæmia*, beginning in the great toe-joint, would be distinguishable by its subsequent course and its peculiar pyrexial range. Sub-acute and chronic articular gout possess a history and causation quite different from *rheumatoid arthritis*, which chiefly affects poor and anæmic women, and usually begins between twenty and forty years of age; all the joints tend to be progressively implicated, but the symptoms are not acute or periodic in

character. Urates are not deposited in the joints or elsewhere, and the urine presents no special peculiarity. Some cases of irregular gout may, however, present great difficulties in diagnosis, and require a careful consideration of possible heredity, with the previous and family histories and habits of the patient, and a minute investigation of the symptoms and progress of the case. Care should be taken not to mistake for gouty gastritis the "gastric crises" which are sometimes observable in the pre-ataxic stage of tabes dorsalis.

Ætiology and Pathology.—Gout has been attributed to a loss of nervous energy, especially in respect of the trophic centres; to congestion of the veins and capillaries; to persistent plethora of the digestive organs, especially of the liver; and to a saturation of the blood and secretions by some specific *materies morbi*.

It is now generally admitted that the disease depends upon a surcharging of the system with some substance or substances resulting from the imperfect oxidation of albumen, and especially of albuminous food-stuffs; and *lithic* or *uric acid* is commonly regarded as the particular *materia peccans*. This, when formed by the liver in excess, appears in the blood as urate of soda; and the deposition of this relatively insoluble salt of uric acid in the various tissues (a process most apt to occur in those tissues, such as cartilage, tendon, and ligament, in which the capillary circulation is naturally feeble), together with its attempted excretion by the various excretories, are believed to evoke the various local changes and the peculiar symptoms which constitute the pathology and the clinical history of gout. In other words, gout expresses the clinical aspect, and *lithiasis*, *lithæmia*, or the *lithic acid diathesis* represents the pathological aspect of the disease.

In order that gout may develop, it is obvious that an amount of uric acid must be formed and retained within the system greatly in excess of that which can be eliminated or destroyed by the normal vital processes. And it is equally plain that this abnormal production of uric acid may be brought about by (1) an excessive ingestion of albuminous food; (2) by lessened oxidation of food-albumen not in itself abnormal in amount; and (3) by excessive ingestion, together with diminished oxidation, of albumen. In practical application to humanity, these may be broadly re-stated as (1) eating too much (of albuminous food); (2) eat-

ing enough, but taking too little fresh air and exercise; and (3) eating too much and not taking sufficient exercise.

Two important conditions—hereditary transmission, already alluded to, and impregnation of the system with lead—act as powerful *predisposing causes*. The influence of a dietary rich in nitrogenous elements, especially such as the coarser fibred and less digestible meats, for example, on the one hand, and of deficient bodily exercise in fresh air on the other, are obvious enough; and both these conditions imply an over-taxation, as well as a neglect to secure the proper performance, of the various excretory organs. Sugary and sugar-forming or starchy foods are prejudicial to the gouty, because, being themselves easily and quickly oxidized, they rob the less readily oxidized albuminoids of the means required for their own complete digestion. Alcohol itself acts in a similar fashion as an inhibitor of tissue change; when combined with, or containing, saccharine matter, as in the heavier malt liquors and the sweeter wines, it is still more detrimental; and the imperfectly fermented wines, like ordinary port and sherry, appear to be specially harmful in this respect.

All causes which provoke dyspepsia in the individual tend to derange the digestive organs, and thus to aggravate the tendency to a production of lithic acid in excess; while the excessive production of the various acids normally formed during the digestive processes tends, by diminishing the normal alkalinity of the blood, both to interfere with the elimination of lithic acid and to favour its deposition within the tissues.

All these influences are aggravated by the ingestion of too little water—a dietetic error specially common amongst those who do not live by the sweat of their brow; for water, in addition to its value for cleansing the inside as effectively as the outside of the body, efficiently promotes tissue-change and waste elimination, and can supply the system with oxygen both directly from its own volume of dissolved air and indirectly by chemical decomposition. Over-fatigue, exposure, exhaustion, imperfect nutrition, and all forms of physical and mental excess act generally by depressing the vito-chemical energies of the system.

Uric acid, when produced in such an excess as to give rise to gout, is found in the blood as urate of soda; and is deposited in the cartilages of joints, both within and between the cells, and in the neighbouring fibrous structures, first as a

syrupy solution, from which acicular crystals of the salt are soon precipitated. Thus, by crystalline accretion arise the uratic infiltrations of the articular cartilages, leading in time to their erosion and destruction; as well as the articular nodulation and enlargement; the thickening and fixation of ligaments, tendons, and fasciæ; the enlargement of bursæ; and the formation of tophi and gouty abscesses and ulcers. The fibrous coats of arteries, from the aorta downwards, the walls of veins, the periosteum of bones, the sheaths of nerves, the membranes of the brain and of the eye, may be similarly affected. The substance of the heart escapes, but that organ may suffer rapid degeneration, owing to an implication of the coronary arteries in the gouty process. In the kidney, crystals of sodic urate appear first within the tubules, forming whitish streaks on section; later, they are deposited in the intertubular tissue, and the irritation provoked by their presence may beget a cirrhotic process, which results in the small, contracted, "gouty" kidney, with a corresponding decadence of functional ability. The liver may undergo a fatty enlargement; and the various mucous membranes and the skin become irritated, congested, and diseased by the presence of a toxic agent which they can but imperfectly eliminate.

During a paroxysm of acute gout, uric acid may be detected in the blood or in the fluid obtained from a blister (provided the latter be not raised in the immediate neighbourhood of an inflamed joint). About mvj of acetic acid are mixed with $\text{ʒ}\text{ij}$ of serum, in a watch-glass; a single thread of linen is immersed in the fluid, and the watch-glass, protected from dust, is set aside in a warm place. In a few hours the serum gelatinizes by evaporation; and the thread, when withdrawn and examined under the microscope, is found to be encrusted with rhombic crystals of uric acid (Garrod).

Crystals of urate of soda have also been discovered in the sputa of gouty bronchitis, and as an efflorescence on the epidermis in cases of gouty eczema and psoriasis.

Treatment.—A consideration of the causation and pathology of gout will indicate the prophylactic treatment—mainly hygienic—applicable to those who inherit the gouty diathesis, and required during the intervals by sufferers from the declared disease. Such persons should correct all indolent and self-indulgent habits; they must avoid an

excess of nitrogenous food, especially the coarser fibred meats, smoked and salted provisions, rich and highly seasoned dishes, pastry, strong wines and beers; and should take but little of sugary and starchy food, and of alcohol in any form.

Plenty of exercise, taken regularly in the open air, but always short of over-fatigue; warm clothing; careful attention to the hygiene of the teeth, skin, and bowels; early hours for rest and rising; thorough ventilation of bed- and sitting-rooms; and the avoidance of every kind of excess are also of great importance. Much can be done in this way to ward off impending attacks and to mitigate their severity, although each individual case necessarily requires special modifications of treatment peculiar to itself.

Dyspeptic symptoms need prompt and careful treatment, and debility will call for tonics, amongst which iron, strychnine, and arsenic in small doses are specially useful, regard being always paid to the presence of the lithæmic diathesis. Many gouty patients are intolerant of quinine.

During an *acute attack* the affected limb should be comfortably raised, and so supported as to be free from pressure, jars, and movement. The inflamed joint may be lightly encased in cotton-wool covered with oiled silk, or in a single thickness of lint saturated with a solution of chloral hydrate (gr. ij to 3j), with or without an equal amount of morphine, or equal parts of the liniments of opium, belladonna, chloroform, and aconite, to which in the later stages potassium iodide (gr. v-x) or potassium chlorate may be added with advantage. Treating the joints to a local vapour bath is often specially grateful in the initial stage of inflammation. Gentle friction with a lanoline ointment containing chloral hydrate gr. ij and pot. iod. gr. x to the ounce relieves the troublesome itching which commonly attends desquamation, and promotes absorption. If the kidneys be sound, and especially if there be indications of hepatic congestion, 3 or 4 grains of calomel, followed by an aperient saline draught, is a useful commencement of medicinal treatment. An alkaline mixture containing gr. xv-xx of the citrate of potassium, and the same quantity of ammonium chloride if there be symptoms of hepatic derangement, may be taken every four or six hours; and if the heart be sound and vigorous, a full dose of colchicum (℥xxx of the wine) may be added to

each dose, but this drug must not be given in routine fashion; its effects should be carefully watched and the dose gradually diminished as the acute symptoms subside.

A regular and efficient action of the bowels must be maintained, preferably by the use of saline aperients, or with the aid of a pill containing rhubarb, podophyllin, colocynth and hyoscyamus, together with small doses of calomel or of grey powder in certain cases.

Efficient perspiration should be encouraged by diaphoretics, such as the liq. ammon. acetatis, if necessary. Enfeebled cardiac action indicates the employment of strychnine or strophanthus, with ether and ammonium carbonate, together with lithia rather than potassium salts. Pain and sleeplessness may require the administration of hypnotics, such as chloral, potassium or ammonium bromide, and of anodynes, such as pulv. ipecac. co., or of morphine *sub cute*. The abstraction of blood, whether generally or locally, is never admissible in acute gout. Diarrhoea, if present, should not be hastily or completely checked.

As regards *diet*, the patient should be encouraged to drink freely of bland aqueous fluids, such as toast-and-water, barley-water, seltzer, potash, and Apollinaris waters (soda-water and all soda salts are best avoided by the gouty, in view of the relative insolubility of urate of soda). Milk usually agrees well, and may be sipped freely, especially if diluted with barley-water or with one of the mineral waters already mentioned. Should there be a tendency to vomiting, half the volume of plain or of carbonated lime-water may be added to the milk. Patients already enfeebled and exhausted will need a more generous dietary, but it must be light, and easily assimilable: beef-tea, mutton and chicken broth, and plain soups, in which, as in milk, an egg may be beaten up. In some cases of extreme debility small and repeated doses of sound whisky, brandy, or old rum may be given, well diluted. The indication for stimulants may, however, usually be more satisfactorily met by the administration of the sp. æth. sulph. in medicinal doses.

As convalescence advances, white fish, fowl, game, and mutton may be gradually added to the dietary; with perhaps a little spirit, well diluted, or small quantities of a sound light wine, such as hock, Sauterne, or still Moselle; until, with the more or less complete re-

establishment of his health, the patient is able safely to resume some appropriate form of the regimen sketched under the head of prophylactic treatment.

Stiffness or effusion persisting in a joint after the subsidence of other symptoms is best treated locally by gentle friction with some stimulating liniment containing potassium iodide, and by hot salt water douches, with passive motion, massage, and gentle, regular, elastic pressure. It is usually an additional indication for the administration of tonics, especially iron, strychnine, arsenic, and phosphorus, together with gentle hepatic stimulants and aperients—*e.g.*, ammoniac chloride, podophyllin, euonymin, rhubarb, and the like.

The treatment of *chronic gout* is to be conducted on the same general lines, but the potassium salts are particularly valuable. Doubt has lately arisen as to the value of salts of lithia as eliminators of uric acid, but they are extensively used in chronic gout. Small doses of colchicum, taken for some time together, are useful. Guaiacum is sometimes of service, and tonic medicines, such as preparations of bark and iron, are almost always so, and especially if there be oxaluria. Local treatment, including friction and shampooing, may greatly improve the condition of joints not hopelessly disorganized. The long-continued use of certain mineral waters, such as those of Bath, Buxton, Harrogate, Woodhall Spa (the water of which contains 0.75 grain of iodine and 3.5 grains of bromine in each gallon), Dinsdale-on-Tees, Aix-les-Bains, Aix-la-Chapelle, Baden, Contrexeville, Royat, Vichy, Wiesbaden and Wildbad, is often productive of good results, and especially when combined with the valuable hygienic measures to which patients are commonly subjected, and to which they more willingly submit, during a visit to such health resorts. Gouty ulcers and abscesses should not be too actively treated; a simple dressing of lint saturated with a lithium or potassium salt, continuously applied beneath oiled silk, answers best.

The various manifestations of *irregular gout* must, like those complications which are apt to arise in the course of the disease, be treated as affections of the organs specially implicated, due regard being always paid to the underlying gouty diathesis. Acute symptoms referable to the heart or stomach, acute gouty colic and collapse may require a

liberal administration of stimulants and anodynes, with warmth to the surface, and sinapisms over the heart and epigastrium. Gouty bronchitis is much benefited by the inhalation of fumes of nascent chloride of ammonium. Arsenic is not always well borne in the cutaneous affections of the gouty, and such patients appear to be sometimes rendered worse by a too rapid mending of their skin troubles. When flannel is not tolerated in these cases, silk articles of under-clothing are useful substitutes.

Sufferers from all forms of gout derive benefit from residence in a warm, dry, and equable climate. Excessive acidity of the urine, and the deposit of urates from the secretion, are at all times strong indications for the administration of alkaline medicines, with moderate doses of aperients. C. E. SHELLY.

GRANULOMA FUNGOIDES (*Mycosis Fungoides*; *Fibroma Fungoides*). A chronic inflammatory disorder, probably of specific origin, which affects the superficial and deep layers of the skin, and occasionally the mucous membranes. The disease is of rare occurrence in this country, but a considerable number of cases have been recorded in France, Germany, and Italy.

Symptoms.—In the early stages, urticarial, erythematous, or eczematous patches, of irregular shape and size, with well-defined margins, appear on various parts of the body, the scalp and skin of the trunk being perhaps their commonest seats; they are attended by much itching, and are not controlled by ordinary treatment. Exudation may take place from minute fissures, and crusts form over the patches.

Resolution and restoration of the skin to its normal condition may occur at this stage, and serve to clearly distinguish this disease from malignant infiltrations. More frequently, however, the patches become hypertrophic and firm, hard nodules, varying in size from that of a pea to an apple, either sessile or pedunculated, develop on them; frequently, also, large subcutaneous lumps like boils appear and disappear with marvellous rapidity.

Usually the nodular tumours break down and form deep, unsightly ulcers, which contain sensitive, fungating granulation tissue, and discharge thin pus and serum. Considerable pain attends the process, and the patient becomes sleepless and depressed.

Finally, the lymphatic system is af-

fect, and a progressive cachexia is established, which terminates in death, often from pneumonia or pleurisy.

Ætiology and Pathology.—The disease almost always affects adults. Nothing definite is known of its ætiology. It is of variable duration, and generally extends over several years, with periods of temporary improvement succeeded by fresh outbreaks. Microscopically the growths are “granulomata”—i.e., cellular infiltrations of the skin and subcutaneous tissues, closely resembling the lesions of leprosy on the one hand, and small round-celled sarcoma on the other. Many authors attribute it to the presence

of a specific micro-organism, and even claim to have reproduced the disease by inoculation in animals, but recent careful researches have failed to confirm either observation.

Treatment.—In the earlier stages, arsenic, pushed to the most extreme limits, is certainly sometimes beneficial, if not absolutely curative. Pyrogallic acid ointments are the best local application, but their action must be carefully watched. Iodoform is useful for the fungating masses. One case completely recovered after an attack of erysipelas.

J. J. PRINGLE.

H

HÆMACYTOMETER (*αἷμα*, blood; *κύτος*, a cell; and *μέτρον*, a measure).—By means of this instrument it has become possible to estimate approximately the number of corpuscles in a given quantity of blood.

It is obvious that such a numeration could not be made in undiluted blood, and therefore, in every method that has been devised for this purpose, care has been taken to dilute the blood in a certain proportion, the fluid employed being a neutral saline, which does not materially alter the size of the corpuscles. The hæmacytometer usually employed in this country, is that devised by Dr. Gowers (1877). It is a modification of a similar instrument introduced by MM. Hayem and Næchet, the modification mainly consisting in having the micrometer scale engraved on the glass slide instead of being introduced in the eye-piece of the microscope.

The apparatus consists of—(1) A capillary pipette, graduated to 5 c.mm., for receiving the blood when drawn; (2) another pipette graduated to 995 c.mm. for receiving that quantity of the diluting fluid; (3) a small glass vessel in which the two fluids can be thoroughly mixed; and (4) a cell the depth of which is exactly $\frac{1}{10}$ millimetre, and on the floor of which there is graven a micrometer scale in squares of $\frac{1}{10}$ millimetre each. The diluent fluid, as recommended by Dr. Gowers, consists of sulphate of soda 104 grains, acetic acid 1 drachm, and distilled water 4 ounces.

The procedure is very simple. The blood is obtained by puncturing the

finger, which should be previously cleansed, and it is important not to squeeze the finger at all forcibly. The drop of blood is drawn up into the tube (1) until the requisite amount is collected (5 c.mm.). This is then ejected into the vessel (3), which has been previously filled with the measured quantity (995 c.mm.) of the saline solution by means of the graduated pipette (2). Here the blood and saline are thoroughly mixed by means of a small glass spatula. The mixture thus consists of 995 parts of saline and 5 parts of blood or as 200 : 1. A drop of this mixture is then placed in the cell, which is completed by adjusting the cover-glass, and, after a few minutes' interval to allow of the corpuscles being deposited at the bottom of the cell, the numeration is made by counting the corpuscles visible in each square. It is well to count the numbers in at least ten squares, and then to strike the average contents of a single square.

The calculation of the number of corpuscles per cubic millimetre of blood is then easily made by multiplying the number per square by 100,000, or the number in 10 squares by 10,000. For since the cell is $\frac{1}{10}$ millimetre in depth, and each square is $\frac{1}{10}$ millimetre, the corpuscular contents of the fluid contained in the small space represented by a single square must, to be expressed as one cubic millimetre, be multiplied by $(5 \times 5) \times (10 \times 5) = 500$, and this again multiplied by 200 will give the number of corpuscles in that amount of undiluted blood. Thus, supposing the average number of corpuscles per square be 50, the number per cubic millimetre

will be $50 \times 100,000$, or $5,000,000$. By this method also, since the normal average of red corpuscles is $5,000,000$ per c.mm., the percentage composition is obtained by taking the average number contained in two squares. Thus, supposing there were 42 per square, the percentage will be 84.

Such a calculation is of course only approximate, since the normal average contents of the blood in red corpuscles varies, according to sex, age, and other circumstances, both above and below the limit named. The number of white corpuscles may be counted by the same means, but it is necessary in their case to count them in a large number of squares before striking the average, owing to their relatively small numbers. In health, for instance, there would be about one white corpuscle to seven or eight squares.

The red corpuscles are somewhat altered in aspect by admixture with the saline fluid, but they retain their relative size. It will be noticed that their colouring matter tends to accumulate in a little mass in the centre of the corpuscle. The white corpuscles are readily distinguished by their glistening aspect. They are best numerated by using a low power (fifty diameters) and noting how many of the squares are visible in the field, as well as the number of corpuscles. After use it is of the highest importance that each part of the apparatus be thoroughly cleansed.

There is no need to describe other forms of hæmacytometer that have been employed. As stated, that of Hayem and Nachet has the squares contained in a micrometer eye-piece and a cell, to receive the diluted blood on the stage, as in Dr. Gowers' instrument. Malassez, for this latter purpose, used a capillary tube, the capacity of a given length of which was known, fixed in the slide. Zeiss and Thoma have devised a method of varying the amount of dilution of blood, and the graduation of their slide is so planned as to facilitate the counting process, the area of the squares being smaller than in Gowers' instrument. But for clinical purposes, where the instrument is required even more for comparative observations than for absolute estimations, the latter apparatus is excellent, whilst the simplicity of its construction and use are not its least merits.

The purposes to which the hæmacytometer may be put clinically are too obvious to require any detailed description. It enables a more accurate estimation of the relative numbers of the red

and white corpuscles to be made than was hitherto possible. It is of considerable service in estimating the action of hæmatinics; and in the diagnosis of cases of essential anæmia it is often of much value. Since, however, it admits of a certain degree of fallacy, which is quite unavoidable in dealing with such a minimal dilution of the blood, it is of less value in physiological research.

SIDNEY COUPLAND.

HÆMATEMESIS (Vomiting of Blood) is a symptom rather than a disease, and occurs in a variety of pathological conditions. These may be divided broadly into two classes—the *general*, or constitutional, and the *local*.

The former class includes various febrile diseases, such as yellow fever and small-pox, also scurvy, anæmia, leucocythæmia, and purpura hæmorrhagica. Hæmatemesis takes place in the various forms of irritant poisoning, and is alleged to be sometimes vicarious of menstruation.

In the latter class a sub-division must be made according as the stomach is or is not the seat of organic disease. Simple ulcer and cancer of the stomach on the one hand, and venous obstruction from hepatic or cardiac disease on the other, form the chief varieties here. Fatal hæmorrhage occasionally occurs from rupture of one of the circle of veins which surrounds the lower end of the œsophagus; and in rare cases, fatal from hæmatemesis of gastric origin, no lesion has been found in the stomach. Blood coming from the posterior nares, or from the lungs during an attack of hæmoptysis, may be swallowed unconsciously and brought up by vomiting, and an aortic aneurysm may perforate the œsophagus or stomach and give rise to profuse hæmatemesis. Malingerers sometimes swallow blood intentionally and bring it up by vomiting.

Symptomatology.—Hæmatemesis is preceded by pallor, giddiness, and a feeling of nausea and faintness. Sometimes actual fainting occurs. Vomiting then ensues, and upon the quantity and quality of the blood brought up the diagnosis largely depends.

Hæmatemesis is remarkable on account of its profuseness in two classes of cases chiefly—namely, in simple gastric ulcer, and in portal congestion due to cirrhosis of the liver. In cancer, on the other hand, the bleeding is usually comparatively small in quantity. The blood oozes slowly into the stomach, and is

acted on by the gastric juice before being vomited, so that it presents a "coffee-ground" appearance. It is difficult to tell sometimes whether such an appearance is due to blood or not; if so, a small quantity of the vomit should be placed in a test-tube and treated with tincture of guaiacum and ozonic ether, when, if blood be present, the characteristic reaction will be observed.

Diagnosis.—Difficulty is sometimes experienced in making the diagnosis between hæmatemesis and hæmoptysis, especially when the vomited blood is not seen. The history of the case will help to a certain extent, but the points chiefly to be relied on are these:—In hæmatemesis, giddiness and nausea are more likely to be felt, inasmuch as a considerable quantity of blood may escape into the stomach before vomiting occurs. Vomited blood is darker in colour, and may be mixed with particles of food. It consists partly of clots, and has an acid reaction. In hæmoptysis, the blood is generally brought up after a sensation of tickling in the throat; it is usually in smaller quantities and is ejected with each act of coughing. It is brighter in colour, alkaline in reaction, and frothy from admixture with air.

It must not be forgotten, however, that when a large quantity of blood is vomited some may find its way into the air passages and excite coughing; and, conversely, if coughed up in the first instance, a portion may be swallowed, and may be brought up by vomiting. In such cases, unless the attack is actually seen, the previous history and the state in which we find the patient must be relied on to guide us. *Melæna* (blackness of the motions) is also almost certain to occur after hæmorrhage into the stomach, some of the blood passing down the intestinal tract, and being so acted on by the digestive fluids as to produce the so-called "tarry" dejections. But here again a source of fallacy arises from the fact that after a profuse hæmoptysis it is by no means uncommon for blood swallowed during the attack to be subsequently passed in the motions.

Pathology and Morbid Anatomy.—In cases of the general class, the hæmorrhage has its origin in the altered state of the blood, and probably also to some extent in weakening of the walls of the vessels. In cancer there is an oozing, generally moderate in amount, from the surface of the new growth. In the case of portal obstruction and obstruction from cardiac disease, the blood-pressure

becomes too great for the capillaries to withstand, and transudation of blood takes place. Hæmorrhagic erosions of the mucous membrane may also be found, and are especially frequent in cases of valvular disease. When profuse hæmatemesis occurs in cases of portal obstruction (*e.g.*, from cirrhosis of the liver), the bleeding seems to take place from the whole mucous surface as from a sponge, and no distinctive morbid appearance may be found in the stomach. The bleeding here may be in greater amount than in any other form of hæmatemesis.

In gastric ulcer the bleeding is caused in most cases by the erosion of the wall of an artery.

Prognosis.—This will depend mainly on the cause underlying the hæmatemesis. So far as the immediate result is concerned, the larger the hæmorrhage the greater the danger. The prognosis is not unfavourable in gastric ulcer in the great majority of cases, even where the hæmorrhage is considerable and repeated. In cancer the ultimate prognosis is of course absolutely hopeless. In cases where the hæmatemesis is due to hepatic cirrhosis the bleeding may be so profuse as to destroy life very quickly; indeed, this is the variety of hæmatemesis in which the immediate danger may be greatest. If, however, the bleeding be moderate in quantity, it may, by relieving the portal congestion, be beneficial rather than otherwise. As regards the other morbid conditions giving rise to hæmatemesis, the prognosis is ruled by the nature of the primary disease.

Treatment.—The patient must be placed in the recumbent position, kept perfectly quiet and cool, and given ice to suck. Nothing else should be taken by the mouth in the first instance. The external application of ice to the epigastrium is also to be recommended. If there be reason to suppose that portal obstruction is the cause of the hæmorrhage, the bowels should be opened by laxatives. If, on the other hand, the diagnosis of gastric ulcer or cancer be made, and the bleeding be not arrested by ice, astringents, such as liquid extract of ergot in $\frac{1}{2}$ -drachm doses with 10 grains of gallic acid, should be given every four hours. Opium, also, will be found invaluable; 3 to 4 grains of the pil. plumbi composita of the British Pharmacopœia (acetate of lead and opium) may be given every four hours. If the stomach be too irritable to retain these, the subcutaneous injec-

tion of ergotine (2 to 5 grains) with morphine ($\frac{1}{4}$ to $\frac{1}{2}$ grain) should be employed.

If the case be one of gastric ulcer, absolute rest to the stomach is the most important element of treatment. This is secured by feeding the patient by means of nutrient enemata or suppositories only, for a week or ten days, after which milk, beef-tea, and soups may be given, and a very gradual return to solid diet permitted.

DAVID W. FINLAY.

HÆMATOCELE, PELVIC.—This term, taken in its most comprehensive sense, means an effusion of blood into the pelvis. Some authors speak of *intra-peritoneal* and *extra-peritoneal* hæmatocele according as the blood is effused into the peritoneal cavity or into the cellular tissue outside it. By others, the term *hæmatocele* is restricted to blood effusions into the peritoneal cavity, the term *hæmatoma* being given to bleeding into the cellular tissue. The terms will be thus used here. An intra-peritoneal effusion of blood usually gravitates into Douglas's pouch, and the condition is therefore often spoken of as *retro-uterine hæmatocele*.

Hæmorrhage into the peritoneum may come from many different causes, and is therefore, strictly speaking, only a symptom, or event in the course of different diseases. But as we cannot always find the cause, we are often obliged to treat the condition without regard to its cause.

1. Hæmatocele may arise from *rupture of a vein in the broad ligament*. The hæmorrhage may take place into the cellular tissue of the broad ligament or into the peritoneum. Either form is rare. When it takes place into the peritoneum it is profuse, and rapidly fatal; death has been known to occur in half an hour. The perforation may be due to ulceration, but cases are so rare that nothing can be said as to the cause of rupture beyond what is known of the pathology of venous hæmorrhage in general. Nor are there any definite symptoms preceding the rupture from which its cause may be inferred.

2. *Hæmorrhagic Perimetritis*.—Inflammation of any serous membrane may be accompanied with hæmorrhage, and the peritoneum is no exception to this rule. Cases of the kind have been recorded, but are extremely rare. Slight hæmorrhage from the newly formed vessels of pelvic adhesions are very common, but they are seldom sufficient to attract clinical attention.

3. Hæmatocele may be the result of the *rupture of an ovary*. At every ovulation, rupture of a Graafian vesicle takes place, and is accompanied by an effusion of blood, probably not in health exceeding 5j. Occasionally, when the ovary is enlarged and very vascular, more profuse hæmorrhage occurs. It is probable, but as the cases end in recovery it cannot be proved, that when signs and symptoms of slight hæmatocele follow fatigue, over-exertion, or sexual excitement they may be due to increase of the hæmorrhage normally accompanying the rupture of a Graafian follicle. In other cases, the ovary has been found enlarged, soft, and sponge-like, and infiltrated with blood (resembling the spleen of a subject who had died from purpura or scurvy). Cases of this kind are rare; nothing is known of their pathology, and the few recorded have been rapidly fatal, either from the amount of the bleeding or from subsequent peritonitis.

4. Hæmatocele may be due to *rupture of a Fallopian tube*. The most common cause of this is extra-uterine gestation. There is good reason to think that extra-uterine gestation often terminates in early rupture, followed by absorption of the effused blood and of the products of gestation. In cases that recover, as the diagnosis cannot be verified, we do not know how frequently this is the cause of hæmatocele. But the experience of operators goes to show that extra-uterine gestation is probably the most common cause of hæmatocele. In some cases the tube is found enlarged, thickened, and containing blood, but neither fœtus nor membranes can be found. Such cases may be results of inflammation of the tube (usually bilateral), or they may be pregnancies in which the fœtus has been overlooked, or perhaps has been absorbed.

5. There may be *bleeding from the tubes* into the peritoneum as a result of fevers, phosphorus poisoning, purpura, scurvy, atrophy of the liver and yellow fever.

6. Hæmatocele may follow *delivery or abortion*, but more often the latter. It has been supposed that the blood from the uterus regurgitates through the Fallopian tubes into the peritoneum. It may also, in these circumstances, be secondary to perimetritis. It is probable that many cases which appear to be of this nature are really cases of ruptured extra-uterine gestation in which the supposed abortion was the expulsion of the decidua.

7. Hæmatocele may be a result of

menstrual retention from atresia of the canal. This is the more likely to cause hæmatocele the higher up in the genital canal the obstruction lies. (*See AMENORRHOEA.*)

8. Retention of menses, leading to regurgitation of blood along the tubes, has been attributed to causes other than atresia, some of which are very doubtful—*e.g.*, congenital stenosis of the cervix, hypertrophy or thickening of the cervix, flexions of the uterus, and spasmodic contraction of the uterus. That tumours or cancer of the uterus may block the canal there is no doubt.

9. *Closure of the tubes* at the uterine end, preventing blood exuded by them from escaping *per vias naturales*, may undoubtedly lead to the formation of pelvic hæmatocele.

Symptoms and Signs.—The previous history of a case of hæmatocele will depend upon the condition to which the hæmorrhage is due. The symptoms at the time of the effusion are those of internal hæmorrhage—sudden pain, faintness, pallor. If examined soon after the blood has been poured out, while it is still fluid, no physical signs will be found (beyond those that may have been present before the effusion), or perhaps there may be some slight fulness around and behind the uterus. When the blood has had time to coagulate, and the outer layers of coagulum to become organized and connected with surrounding parts, the physical signs become those of an effusion into the peritoneum. The signs are the same whether the effusion be of inflammatory lymph, of serum, of pus, or of blood. The outline of the swelling felt per vaginam is that of the peritoneum, which forms its lower boundary. A tumour is present which is fixed, dips down lowest behind the uterus, cannot be felt in front of it, and at the sides joins the uterus a little above the level of the internal os, and laterally retreats beyond the reach of the finger in the vagina. If the tumour be large, and the space within which the blood is effused limited by adhesions, the uterus will be displaced forwards. We infer that such an effusion is a hæmatocele when its formation is accompanied by signs and symptoms of internal hæmorrhage (pallor, faintness, &c.) rather than by those of inflammation (febrile disturbance). A large effusion may by its pressure cause disturbance of the surrounding parts; hence irritability of bladder, or retention of urine, rectal tenesmus, and some degree of proctitis are frequently present.

Course and Treatment.—If the patient survive the immediate shock of the hæmorrhage, the usual course of pelvic hæmatocele is to complete recovery by absorption of the effused blood. If the case appear to be following this course, which will be evidenced by the gradual improvement in the patient's condition and progressive diminution in the retro-uterine swelling, no treatment will be called for other than expectant—*i.e.*, rest in bed while there is any pain or fever, tonics if appetite fail, laxatives to prevent disturbance by the passage of hard scybala. But the case may be seen when it does not seem to be tending towards recovery. (1) A case is very seldom seen while hæmorrhage is going on, because, usually, during the time spent in summoning medical aid and in making necessary arrangements, either the hæmorrhage stops or the patient dies. But if a patient be seen in this condition, and it be possible, before she is reduced to a moribund condition, to open the abdomen, it is proper to do so. (2) If a slight hæmatocele be followed by signs of increase, a course which points to the persistence of the condition causing the hæmorrhage, the abdomen should be opened. (3) If the effusion be so great as to cause serious trouble by its size, such as retention of urine or obstruction of the bowel, or if febrile symptoms come on and lead to the inference that suppuration has occurred, laparotomy should be performed in preference to tapping by the vagina. By tapping, fluid is drawn off, but nothing curative is effected; and if the diagnosis be erroneous, tapping may be injurious. If the abdomen be opened, any morbid condition present can be effectively dealt with; and if the operator be competent, the danger is scarcely, if at all, greater than that of tapping by the vagina.

G. E. HERMAN

HÆMATOCOLPOS means retention of blood in the vagina from atresia of that canal (*see AMENORRHOEA*). Beside the usual form, we may have blood retained in one half of a double vagina. In that case we shall find a fluctuating swelling extending down one side of the vagina, and usually on its anterior aspect. As the point of closure may be anywhere in the length of the vagina, the swelling does not always extend down to the vaginal orifice. If the atresia be high up, the blood may be contained in a cavity formed by the vagina and cervix uteri, but it is impossible to say how

much of it is formed by the uterus and how much by the vagina. The *treatment* is to let out the blood by incision, and then cut out a large piece of the septum to prevent it from closing again.

G. E. HERMAN.

HÆMATOMA, PELVIC.—A pelvic hæmatoma is an effusion of blood into the cellular tissue of the pelvis.

In the unimpregnated condition it is rare except as a result of direct violence, or from diseases accompanied by a tendency to hæmorrhage, such as hæmophilia, purpura and scurvy. With these exceptions, it is almost exclusively a disease of pregnancy and the puerperal state. In pregnancy, the veins which return the blood from the genital organs become very large, often varicose, and are liable to rupture either from slight direct violence or as a result of pressure. If this happen, bleeding takes place into the cellular tissue.

If the effusion be slight, so that it does not extend beyond the cellular tissue of the pelvis, it will be distinguished from an intra-peritoneal effusion of blood by being situated at the side of the uterus instead of behind it, and, as a rule, on one side only. The mass which it forms will be in apparent continuity with the uterus as low down as the vaginal insertion, and instead of retreating beyond the reach of the finger, like an intra-peritoneal effusion, it slopes off towards the bony wall of the pelvic outlet. Like an intra-peritoneal swelling, it is fixed, and, like it, as time goes on, gets smaller and harder, and finally disappears. Effusions so small as to be limited to the cellular tissue within the pelvis produce only slight symptoms, which, as to their kind, resemble those of intra-peritoneal hæmatocele, and the case only requires expectant treatment.

In pregnancy or the puerperal state the effusion is seldom limited to the cellular tissue within the pelvis. It usually extends down by the side of the vagina into the labium, where it forms a swelling which may reach the size of a foetal head. The symptoms are mainly those produced by the size and tension of the swelling. The patient will call attention to the swelling, complain of pain in it, and state that both pain and swelling began suddenly. The local troubles are usually more urgent than the general condition. The swelling is tense, at first fluctuating, then of a boggy consistence. It is dark blue or purple in colour, and this, together with its sudden

formation, will distinguish it from an abscess. It is not reducible, by which it is known not to be a hernia. Tumours of the labium will be of still more gradual formation than either of these conditions.

The *treatment* is to keep the patient recumbent, in order to prevent further bleeding, and to relieve pain and prevent inflammation by an evaporating lotion (liq. plumbi subacet. ʒss, spt. vin. rect. ʒss, aq. rosæ Oj). Under this treatment absorption will gradually take place, and as the swelling diminishes, pain will also lessen. Should labour come on, and the swollen labium obstruct the passage of the child, it may be necessary to incise it, or it may burst spontaneously. If either of these events happen, the cavity should be emptied of clot as thoroughly as possible, well washed out with an antiseptic solution (corrosive sublimate 1 in 2000), and a drainage-tube, reaching to its deepest part, inserted. The cavity should afterwards be washed out daily with an unirritating antiseptic, such as a saturated solution of boracic acid. The patient should be kept recumbent until the cavity is nearly filled up.

G. E. HERMAN.

HÆMATOMA AURIS (Bloody Tumour of the Ear.—Insane Ear).—An effusion of blood between the cartilage of the ear and the perichondrium.

Symptoms.—The affection occurs in two forms, the acute and chronic. It begins most commonly in the upper angle of the hollow of the concha, sometimes in the fossa of the helix, and very rarely in the fossa of the antihelix, or in the external auditory meatus. In the acute form a bright red, or bluish-red swelling occurs, and reaches the size of a pigeon's egg in from twelve to forty-eight hours. The tumour is elastic or firm upon palpation, is slightly tender, and generally painless. The absence of tenderness or pain is perhaps mainly due to the mental condition, which is always extremely unfavourable in the subjects of this affection.

In the chronic form the swelling, heat, and injection are much less; the tumour in a few weeks attains the size of a bean and slowly shrivels. In the acute form the tumour, if left to itself, will sometimes suppurate and burst, if blistered it generally shrivels slowly, if incised the same result is more rapidly attained. In any case the result almost invariably is considerable deformity; a hard compact puckered mass, of a dull, dead-white

colour, with tough adherent skin, being left. The pinna loses its form, becoming much distorted and contracted, its graceful curves and hollows disappear, and it remains hard, rigid and resistant.

Pathology and Ætiology.—Hæmatoma auris has been attributed to various causes, to traumatism, degeneration of the aural cartilage, a general condition of the blood, and to local changes in the arterioles. With regard to traumatism, it is a suspicious circumstance that the left ear suffers in the large majority of cases, the left side of the head being that which is most likely to come into contact with the right hand of the attendant, but cases occur quite independent of external violence. In many cases the injury can be traced to the restless habits of the patient. The exact pathology of the affection still remains somewhat doubtful.

Hæmatoma is much commoner among men than women, and is always associated with long-continued excitement and restlessness. In men it occurs most frequently among general paralytics, sometimes in chronic maniacal excitement, rarely in acute mania, active melancholia, chronic epilepsy or terminal dementia. Hæmatoma is usually unilateral, if both ears are attacked there is generally, but not always, an interval, extending from a few days to months or even years. Hæmatoma auris occurs occasionally among the sane, and is then always the result of injury. The writer has seen two cases among football players, and a similar condition is known among pugilists. It is said that a Greek sculptor has represented a boxer with a shrivelled ear. (*Vide* GENERAL PARALYSIS OF THE INSANE.)

Treatment.—In the chronic form a natural cure generally occurs, and this may be hastened by the application of acetum cantharides, or liquor epispasticus. In the acute form the early use of strong lead lotion, or some blistering fluid, often gives a satisfactory result, but multiple punctures, aspiration, or incision are recommended by some writers. The excited condition of the patient, and the probability that any dressing will be promptly removed, render the adoption of these methods undesirable. In the writer's experience early blistering is the best treatment. The blistering agent may be applied to the cranial aspect of the pinna. If incision be preferred, it should be done early, and the ear should be strapped to the head. Considerable

deformity is the usual result of this affection.

GEORGE REVINGTON.

HÆMATOMETRA means retention of blood in the uterine cavity from occlusion of the cervical canal.

It is rare as a congenital condition; its usual causes are cicatrization after injuries in parturition, sloughing, ulcerations, or cauterization.

The *treatment* is to let out the retained blood by an incision through the occluded part, and to keep the canal patent by a stem until the incision has healed (*see* AMENORRHOEA).

Unilateral hæmatometra presents greater difficulty in diagnosis. This term implies that there is retention of blood in one half of a double uterus. The patient may menstruate regularly from the other half, and therefore the guidance given by the symptom of amenorrhœa is wanting, but dysmenorrhœa is usually present. The tumour is formed during menstrual life. It is tense, may fluctuate, and is situated at the side of and close to the uterine canal which is permeable, and which it displaces to the opposite side. It is distinguished from an ovarian tumour by its close adherence to the uterus and its situation low down in the pelvis. In the cases seen by the writer the greater bulk of the tumour has been in front of the open uterus. The natural cure of unilateral hæmatometra by spontaneous opening and discharge of the retained blood is more common than the same occurrence in the ordinary form of hæmatometra. It may also rupture into the peritoneum, or the retained blood may distend the whole tube and escape from it into the peritoneal cavity either by rupture of the tube or through its natural opening. In either case peritonitis is the result.

The *treatment* is to make an opening with the knife, antiseptic precautions being carefully observed, and to keep it open with a glass stem until the margins of the opening have healed. The presence of unilateral hæmatometra does not prevent pregnancy in the naturally developed half of the uterus. It is often associated with absence of the kidney on the malformed side. In very rare cases there may be *retention of blood in an imperfectly developed uterine cornu*, the cavity containing blood being only connected with the cervix uteri by a band of fibro-muscular tissue. It would be scarcely possible to distinguish such a

tumour from an enlarged ovary or a dilated tube. The best treatment would be to remove it by abdominal section.

G. E. HERMAN.

HÆMATOTHORAX.—Hæmorrhage may take place into the pleural cavity under several conditions, of which the following are most frequently met with:—(1) In simple and tubercular pleurisy the fluid occasionally contains blood which has escaped from the newly formed capillary vessels. Blood-stained effusions may also occur in cases of serous effusion in the subjects of scurvy or purpura. (2) Active hæmorrhage may be produced mechanically by direct injury, involving any of the vessels of the lung or chest wall, or of the diaphragm. The rough end of a fractured rib, or a direct stab, or an incautious incision in the operation of thoracentesis may all produce bleeding of this kind. (3) The rupture of an aneurysm of the aorta may fill the pleura with blood. (4) Bleeding may take place from the surface of cancerous or other growths affecting the pleura, or from disintegrating tubercular deposit leading to ulceration.

Treatment.—But little need be said as to the treatment of this condition. In cases of acute pleurisy the diagnosis will only be made when the fluid is being withdrawn, and the treatment of the case will be determined by other considerations. If there be reason to suspect the presence of a malignant growth, it is generally best to leave the case alone. For the treatment of hæmatothorax the result of injury or incised wound, works on surgery should be consulted.

HÆMATURIA.—A condition in which blood is mixed with the urine.

The discovery of red corpuscles is considered a sufficient proof of its existence; if none be present, the term is not applicable. When only the colouring matter of the blood is found in the urine, the term hæmoglobinuria or hæmatinuria is used to designate the condition (see HÆMOGLOBINURIA).

Characters.—The colour varies within wide limits. It depends upon the relative proportions of the blood and urine, on the completeness of the admixture, and on the chemical changes effected thereby. When the blood is derived from the kidney, the intermixing is complete, and the colour of the resulting fluid is sometimes that of pure blood,

but more often a dingy smoky tint prevails, and a red, brownish, or beef-tea coloured sediment is deposited. Sometimes no naked-eye change is perceptible. Every gradation between these types may be found. Blood casts are often present.

When the bladder or the urethra is the source of the blood, it is less intimately mixed with the urine, and retains more of its characteristic appearances. In the former case, the proportion of blood distinctly increases towards the end of micturition. In the latter, it is expelled at the outset and often at the end, as well as—in some cases—in the intervals between the successive repetitions of the act. In both it is frequently clotted. Flat clots come from the bladder; long cylindrical clots in most cases from the ureter. Profuse hæmorrhage is generally due either to tumours or to calculi.

Tests.—The most satisfactory and the most easily applied test is the *microscope*. The red blood discs are easily recognized, though they but rarely retain their normal bi-concave shape. In urine of low specific gravity they become globular, but crescentic or crenated when the specific gravity is high. They are so pale that their colour fails to characterize them. The only objects likely to be mistaken for them are pus corpuscles, which are larger, granular, and easily clarified by acetic acid (see PYURIA); vegetable sporules (*e.g.*, torulæ), which, if not oval and nucleated, have a more highly refracting margin; broken dumb-bell crystals of oxalate of lime, which may generally be identified by the presence of neighbouring uninjured crystals, or the remains of a piece of the connecting bar still adherent to the fragment; and finally the nuclei of renal epithelium. These are recognized, as in the previous case, by fragments of the cell adhering to the nucleus, by the presence in the same specimen of properly formed cells, and by the readiness with which they absorb logwood or methyl aniline staining fluids.

The remaining tests only show the presence of blood-colouring matter, and are therefore equally characteristic of hæmoglobinuria.

(1) Almen's, or the *guaiacum test*, is the one most frequently employed. The reagents needed are the freshly prepared pharmacopœial tincture of guaiacum, and peroxide of hydrogen. The latter is so unstable that a 15 per cent. solution in ether is generally substituted. The solu-

tion is known as "ozonic ether," and, if kept in a properly stoppered bottle, will last some years. Two or three drops of the tincture of guaiacum are added to about a drachm of urine, and the fluid shaken; about twenty drops of ether are then poured upon the top of the mixture. If blood be present, a blue colour appears at the junction of the fluids. This reaction is given by saliva, iodide of potassium, and some other substances when treated in a similar manner, and is therefore, taken by itself, untrustworthy.

(2) *Heller's test* is obtained by boiling urine previously rendered alkaline by liquor potassæ. It consists in the production of a reddish-brown precipitate made up of phosphates and blood-colouring matter.

(3) The *spectroscope* furnishes the most reliable test. The urine, if very dark, should be diluted until it readily transmits light. On placing the glass vessel containing it between the prism and the light, two black bands make their appearance between the D and E lines—i.e., in the yellow and the green parts of the spectrum. These are due to the presence of oxy-hæmoglobin. If this be reduced by the addition of a solution of ammonium sulphide, the two bands are replaced by a single one broader than either, and situated between them. Exposure to the air will re-oxidize the hæmoglobin, and the two bands may again be seen.

(4) Another very reliable test consists in the production of hæmin crystals from the precipitate obtained in Heller's test by drying it on a glass slide, warming with a drop of glacial acetic acid and a fragment of salt, and then setting it aside to cool. It has not much clinical value, as the crystals are somewhat difficult to obtain when only a small quantity of blood is present, and it is much more laborious than any of the preceding tests. In legal cases tests (3) and (4) are essential.

Causation.—The varieties of hæmaturia are generally classified according to the part of the urinary tract whence the blood is derived.

1. **Renal.**—(1) In *congestion* due to a chill or one of the acute fevers the amount is small, the urine slightly smoky, whilst blood casts and other microscopic evidences of the condition are present. Cantharides, turpentine, cubeb, copaiba, potassic nitrate, quinine, and carbolic and hydrochloric acids, in toxic doses, may give rise to hæmaturia. Their irritating effect is

transitory, and is chiefly exerted upon the upper part of the urinary tract. A small amount of blood may also occur in the albuminuria of pregnancy. (2) *Inflammation*.—In acute Bright's disease the amount is variable. Blood casts are generally numerous. In suppurative nephritis and acute pyelitis the amount is small. (3) *Tumour*.—Here the hæmorrhage may be profuse; it frequently depends on some slight injury, and is irregular, both in the duration of the attacks and in the length of the intervening periods. Sometimes clots are formed, in which case renal colic may result. In other cases, especially when the cortex is involved, blood casts may be found. (4) *Tubercle*.—When the disease is primary there may be sufficient blood to tinge the urine, but its presence is often first ascertained during the microscopic examination of the deposit, when thready blood clots and pelvic epithelium may be discovered. (5) *Renal Embolism*.—The quantity is small, the onset and disappearance are sudden, and the duration of the attack is brief. (6) *Calculi*.—Large amounts appear at intervals, especially after trivial injuries, while much smaller quantities, with pus cells, epithelium, and various crystals, are often almost constant. (7) *Parasites*.—In hydatid disease the urine may be tinged with blood. Hæmaturia due to the bilharzia hæmatobium has already been described. (8) *Cystic disease*.—Blood is but rarely found. According to Ebstein, however, its appearance is frequent and intermittent. (9) In hæmaturia of *traumatic* origin suppression of urine often accompanies the condition.

2. **Bladder and Prostate.**—Hæmaturia may be due to (1) *congestion*, (2) *inflammation*, or (3) the presence of a *simple or malignant tumour*. In the latter case the bleeding is generally profuse, and its occurrence intermittent. (4) *Tubercular disease* only occasions hæmorrhage when ulceration is present. (5) *Calculus*. (6) *Parasites*. Hæmaturia due to the bilharzia hæmatobium is mainly of vesical origin. The spiked ova may be found in the blood and mucus passed at the end of micturition. (7) *Ruptured varicose veins*, sometimes known as vesical hæmorrhoids.

3. **Urethra.**—The chief causes of urethral hæmorrhage are—(1) *inflammation and ulceration* as in gonorrhœa; (2) *injury*; and (3) the lodgment of a calculus.

4. **General Diseases.**—(1) *Hæmorrhagic diseases*—e.g., purpura, scurvy,

hæmophilia, leucocythæmia, and pernicious anæmia. In these cases, excepting the last, the blood is generally derived from the pelvis of the kidney or the bladder. Hæmaturia is of rare occurrence in pernicious anæmia, and its cause is doubtful. (2) *Acute specific diseases*—e.g., cholera, yellow fever, remittent and intermittent fevers, and the malignant forms of the exanthemata. (3) A few cases have been described in which asthma, extreme mental emotion, and the malignant forms of the exanthemata, and vicarious menstruation, have been the assigned causes.

5. The possible admixture of blood with the urine after it has left the urethra must not be forgotten. This may occur during menstruation, or in the presence of any vaginal or uterine discharge containing blood. In these cases there is rarely intimate mixing, and normal urine can be withdrawn by the catheter. Suspected malingerers should be made to pass water under observation.

Occasionally, no cause for the hæmaturia can be made out.

Diagnosis.—The principal facts to be determined in any given case are—(1) the colour and the microscopic appearances of the urine; (2) the constancy of the morbid condition; and (3) the degree of admixture.

Prognosis.—This depends on the cause. In those rare cases in which none can be made out the prognosis is generally good.

Treatment.—This again varies with the cause. Where no diagnosis can be made, it may, in the meantime, be necessary to treat the hæmaturia. The only therapeutic measures common to all conditions producing it are—first, absolute rest in bed, and, secondly, relief of the bowels. Cold and astringents are generally recommended, but only when acute inflammatory conditions can be excluded. The cold should be continuous, and should be applied as closely as possible to the supposed source of hæmorrhage. Astringents may be given by the mouth, or may be injected into the bladder. In the first case, gallic acid, ergot, acetate of lead, perchloride of iron, and turpentine have been administered; for the purpose of injection, alum ($\frac{1}{2}$ drachm to a pint of cold water) is almost exclusively employed.

H. MONTAGUE MURRAY.

HÆMOGLOBINOMETER
chæmoglobin; μέτρον, a measure).—It is very important in many cases of

anæmia or other blood disease to know, not merely the amount of red corpuscles in the blood, but the quantity of colouring matter that they contain. For anæmia depends primarily on a deficiency in this constituent, and there are conditions—e.g., chlorosis—where the corpuscular richness may not be much, if at all, below the average, whilst the richness in hæmoglobin may be considerably less than normal.

The simplest and most readily available instrument for clinical use is the hæmoglobinometer, invented by Dr. Gowers (1879). It is intended to give an approximate estimate of the percentage amount of hæmoglobin in the blood, and is based on the comparison of a specimen of diluted blood with a standard mixture of the tint of the same amount of blood diluted with 100 times its volume of distilled water. The apparatus consists of two small tubes of the same calibre—one of which contains the standard (a mixture of glycerin jelly and picro-carmin in such proportion as to give the tint of 20 c.mm. of blood diluted 100 times—i.e., in 2 c.c. of water), the other is graduated in equal parts of 100 divisions in 2 centimetres (100 times 20 c.mm.). Blood to the amount of 20 c.mm. drawn from the finger is received into a fine tube. It is then transferred to the graduated tube, and distilled water is dropped in and thoroughly mixed with the blood by shaking the tube. The colour of the mixture is from time to time compared with the tint of the standard in the other tube, and, when the two approximate, no more water is added. Supposing the standard tint be attained after water has been added to the level of 65 on the graduated tube, then the percentage of hæmoglobin would be 65. It will be found in practice that the tint of the standard is not quite that of diluted blood, owing to the greater opacity of the latter, but the test is sufficiently accurate for comparative observations. Other, but less simple, if more accurate colorimetric methods have been devised by Preyer, Hoppe-Seyler, and Malassez.

SIDNEY COUPLAND.

HÆMOGLOBINURIA (Hæmatinuria) is the term applied to urine containing blood-colouring matter in a form apart from red blood discs.

Characters.—The urine may be clear or turbid, and may vary in colour from a pale pink to a reddish black. Usually it is dark red, and is stated by the patient

to resemble porter or the sediment of beef-tea. On standing, it deposits a still darker sediment, which, when examined under the microscope, is found to consist of dark amorphous granules, with renal casts, apparently composed of similar material. A few red corpuscles may be recognizable. Crystals of hæmin and of oxalate of lime, as well as hyaline casts, are occasionally present. In rare instances the colouring matter takes the form of discs of various sizes. The coagulated albumin is dark, and is often not in larger quantity than may be due to the proteid contained in the red blood discs. Occasionally it is more plentiful, and occasionally also it seems, when coagulated, to show a peculiar tendency to float on the surface of the urine. The specific gravity is generally high, the reaction acid, and the urea liable to considerable variation above or below the normal standard.

Tests.—With the exception of the different microscopic appearances, these correspond to those given under HÆMATURIA.

Classification.—The cases in which hæmoglobinuria occurs fall clinically into two classes. One of these, characterized by recurring periodic attacks, is known as “paroxysmal” or “intermittent” hæmoglobinuria. The other is made up of certain toxic conditions and of certain febrile states in which hæmoglobinuria forms an occasional but prominent symptom.

(1) **Paroxysmal Hæmoglobinuria.**—The immediate antecedent to an attack is usually exposure to cold in a severe or, it may be, only a mild form. In some cases it occurs only in the morning; in others, only in the winter. Exhaustion and malaria are other recognized causes.

Symptoms.—The onset is marked by a sensation of cold, and generally by shivering, as well as by lumbar pain. This is sometimes very intense, extending down the thighs, and accompanied by retraction of the testicles. The extremities become blue and cold, and the temperature rises from two to five degrees. About this time, or during the sensation of heat and the sweating that rapidly follow, the urine is found to be discoloured, and the proportion of corpuscles in the blood is found to have fallen from 2 to 15 per cent. The hæmoglobinuria may persist some hours after the other symptoms have disappeared. Its onset and cessation are quite sudden, and the attack is over in less than twenty-four hours after the first symp-

tom. The destroyed corpuscles are replaced in a few days. Fever of a malarial type is sometimes present, and a yellowish discoloration of the skin, with or without purpuric spots, has been observed in many cases.

Pathology.—In some cases it has been found that the disintegration of corpuscles observed in the urine exists simultaneously in the blood removed by cupping or by puncture, and that the change can be artificially produced in those liable to the condition either by cold or by local interference with the circulation. It would therefore appear that the disease is one of unduly rapid and incomplete blood metabolism, the breaking up of the blood discs occurring in the cyanosed parts. It is uncertain whether the kidneys merely fulfil their ordinary excretory function, or whether, in addition, their vessels are liable to a vaso-motor spasm similar to that affecting the extremities. The association between this condition and Raynaud's disease is so close that many writers regard them as identical; or, in other words, as complementary manifestations of a common process (see RAYNAUD'S DISEASE). Ralfe classes with them a condition in which the symptoms usually associated with hæmoglobinuria are present in a very mild form, and are accompanied by increased discharge of urea and by albuminuria, but not by hæmoglobinuria itself. Many of these attacks were observed in persons who also suffered from hæmoglobinuria. Closely allied to these is pernicious anæmia, in which the hæmolytic action is also increased, and therefore also the urea and urinary pigment.

(2) **Toxic Hæmoglobinuria.**—This condition occurs as an occasional symptom of poisoning by any of the following substances:—Chlorate of potassium (the most frequent); carbolic, hydrochloric, sulphuric, and pyrogallic acids; carbon dioxide; arseniuretted and phosphuretted hydrogen; nitro-benzene; naphthol; mushrooms; also in the following febrile states:—Typhoid fever, scarlatina, septicæmia, and pyæmia. It has been recorded as occurring in an epidemic form among infants; and may appear in cases of burns, fat embolism, purpura, scurvy, and after transfusion of blood from animals of a different species.

Under the following heading both forms of the condition here described are included.

Symptoms.—The only symptoms common to a large number of cases are

rigors, vomiting, and diarrhœa; these are often followed by cyanosis and fatal collapse. In the epidemic form the children became collapsed about the fourth day of life, and died thirty-six hours afterwards. The skin was yellowish, and the superficial veins dark and very visible.

Diagnosis.—If the urine be examined, no mistake is possible. The pain may simulate renal colic, but is bilateral.

Prognosis.—In the first group there is no immediate danger. The occurrence of attacks can generally be prevented by a careful avoidance of the ascertained cause. The cases falling under the "toxic" group are almost invariably fatal.

Pathology.—The kidneys in many cases are of a deep chocolate colour, with radiating striae of a still deeper tint. The tubules contain hæmoglobin. The assumed explanation is a destructive metabolism of the blood.

Treatment.—In the paroxysmal form the diet should consist of hot soups, the clothing should be woollen, and quinine should be administered in large doses. The drug is most efficacious in the cases which most closely resemble ague. During the attack warmth is practically the only remedy. During the intervals protection from all forms of exposure is essential, but especial attention should be paid to the particular cause in each case, as, if this can be avoided, the attacks may often be altogether averted. The patient should, if possible, reside in a warm climate.

H. MONTAGUE MURRAY.

HÆMOPHILIA, or the "hæmorrhagic diathesis," is the term applied to that condition of the body in which there is a great tendency to hæmorrhage, traumatic or spontaneous, and often great difficulty in its arrest.

In the subjects of this remarkable tendency comparatively slight injuries may be followed by serious and even fatal consequences. For example, a slight blow on the surface of the body may produce a large hæmatoma, or the extraction of a tooth may be followed by uncontrollable hæmorrhage. There is also a marked tendency to articular affections, which may take the form of either a simple serous effusion resembling rheumatic synovitis, or a hæmorrhagic effusion, which may be spontaneous, or follow some trifling injury. The effusion, when serous in character, is sometimes excessive in

amount. The knee is the joint most commonly affected. Many cases prove fatal from traumatic hæmorrhage, but in others spontaneous bleeding occurs from the bowels or stomach, or into the brain, and causes death.

The subjects of hæmophilia seldom attain adult life, in spite of the greatest care. Their fatal tendency usually cuts them off in childhood. But cases are recorded which are exceptions to this rule, and it is said that the tendency to bleed is less marked as age advances.

The *pathology* of the condition has been variously interpreted, but it may best be given in the words of Sir W. Jenner, who, in commenting upon a case before the Clinical Society in 1876 (*Lancet*, vol. ii. 1876, p. 718), stated that the points impressed on him by his experience of the disease were:—"(1) That the tissues are all soft, so that they bruise easily. (2) That the blood is rather slow in coagulating, but its coagulum, when formed, is as firm as in health. (3) That blood is formed rapidly; that there is a tendency to plethora of the smaller vessels, and that injuries have the worst effect, and spontaneous hæmorrhages are most likely to arise when the patient is looking his best."

Examination of the blood has not revealed any characters beyond those of marked anæmia, due to the hæmorrhage, so that after death the quantity of blood in the vessels is scanty, pale, and watery. Dr. Percy Kidd has found changes in the smaller vessels, especially the veins (endothelial proliferation and defective formation of the adventitia), and it is highly probable that the cause of the bleeding depends upon such changes in the vessel walls together with the plethoric state.

The conditions found post-mortem include the presence of hæmorrhages in various organs and tissues, especially in sub-serous and sub-mucous tissues, but also in the substance of organs; of hæmorrhages into joints and intermuscular spaces; and the lesions of anæmia, especially fatty degeneration of the heart. Sir W. Jenner states that cardiac malformations are frequently present.

Ætiology.—The tendency first shows itself in early childhood, more particularly at the period of the second dentition. Although preponderating amongst males, females are not wholly exempt from hæmophilia, and beyond puberty they are exposed to the additional risk of menorrhagia, and of flooding after

delivery. *Hæmophilia* is also notable for the manner in which it is transmitted by heredity. Rarely met with in females, it is conveyed through the female line. Thus in a family the sons, or some of them, may be "bleeders," whilst the daughters are quite free from the diathesis. If any of the sons survive and marry, their children may wholly escape; but the male children of the daughters are very likely to be bleeders.

Lossen (cited by Klebs, *Allg. Path.*, Th. i. 1887) gives an example of a family in which three sons were bleeders; one son and two daughters were non-bleeders. One of the hæmophilic sons had two children (son and daughter), neither of whom were hæmophilic; one of the daughters had five sons, all hæmophilic, and three daughters who were non-bleeders. The other daughter had eight hæmophilic sons and four non-hæmophilic daughters, one of whom had a hæmophilic son and two non-hæmophilic daughters. It is noteworthy that in the third generation this was the only hæmophilic out of at least fifty children, showing that the tendency dies out in course of time by marriage with non-hæmophilics.

Colour-blindness and pseudo-hypertrophic muscular paralysis similarly tend to be transmitted to males through the female line.

Treatment.—The prophylactic treatment of hæmophilia rests in the pursuit of a regular life, avoidance of excitement and of excess. To again quote Sir W. Jenner:—"Every month or oftener a mercurial, followed by sulphate of soda, should be administered, in order to control the tendency to plethora. The saline should also be given once every week, and both should be repeated at any time when the patient appears to be fuller of blood than normal. The diet should be rather dry, with a considerable proportion of white meat, and plenty of open-air exercise should be taken. The greatest care should be observed in order to avoid mechanical injuries." For the arrest of external hæmorrhage, strong styptics must be used, the perchloride of iron being the best. The same drug may also be employed in enemata to control rectal bleeding. Ice-bags may be applied to the joints when there is effusion into the synovial cavity. Pressure must be used to arrest the bleeding from cuts; often, however, in spite of every care, the hæmorrhage cannot be checked.

SIDNEY COUPLAND.

HÆMOPTYSIS.—Expectoration of blood may be the result of many different causes, but the term hæmoptysis is usually confined to those cases in which the hæmorrhage takes place from some part of the respiratory tract. Aneurysms of the aorta perforating the lung or large air tubes, and bleeding from the cavity of the mouth or nasopharynx, may give rise to the same symptom, and may thus simulate true hæmoptysis.

Pathology.—If we exclude the slight hæmorrhage which is occasionally seen in connection with blood conditions such as hæmophilia, scurvy, purpura, and certain infectious diseases, in which diapedesis of red corpuscles occurs without gross vascular lesion, it may be said that hæmoptysis is invariably a consequence of the rupture of blood-vessels, and in most cases this depends on morbid conditions of the lungs. Inasmuch as phthisis or chronic tuberculosis is the cause of hæmoptysis in the great majority of instances, we may commence by considering the pathology of pulmonary hæmorrhage in this disease.

The distinction usually drawn between initial hæmoptysis and that which occurs at a later period of the disease is not without value, but, unfortunately, it is not always possible during life to estimate the stage at which phthisis has arrived.

Pulmonary hæmorrhage may be the result of two main conditions—simple congestion, and structural lesions of the blood-vessels of the lung.

Hyperæmia and rupture of capillaries will undoubtedly account for slight hæmoptysis, and this is probably the explanation of many of the minor hæmorrhages met with in phthisis, as well as in bronchitis, emphysema, certain cases of pneumonia, pulmonary embolism, hydatid of the lung, mediastinal tumours of various kinds, cardiac disease, cases of high arterial (aortic) tension, alcoholism, and, perhaps, in vicarious menstruation.

The more profuse attacks of hæmoptysis can hardly be the result of simple congestion, and the explanation of the hæmorrhage must be sought in perforation of some large vessel. This is brought about probably in three different ways. In the first, branches of the pulmonary artery and veins become weakened in consequence of the development of a tuberculous growth in their walls. This change commonly leads to thrombosis and occlusion of the vessel; but softening

and rupture of the vascular wall may also ensue.

The same result may possibly occur in non-tuberculous cases, where the pulmonary artery has undergone atheromatous degeneration.

In a second and commoner form, ulcerative softening of tubercular masses extends to large vessels, and thus gives rise to extensive hæmorrhage. Progressive excavation and gangrenous processes may occasion hæmoptysis in a similar manner in non-tuberculous affections.

A third and far more important vascular lesion consists in the development of aneurysms of branches of the pulmonary artery situated in the walls of cavities. The pathology of these aneurysms is as follows:—The formation of a vomica in the lung, involving a loss of support of the vessels lying on the floor of the cavity, leads to a weakening of their walls on the exposed side. As the result of this change, aided probably by the development of a secondary arteritis, an artery gradually dilates to form a lateral expansion or aneurysm. In the ordinary form, the bulging affects only one side of the vessel; but, occasionally, an artery crossing a cavity becomes uniformly expanded, constituting a fusiform aneurysm. In size, these aneurysms may vary from a pin's head to a plum, though, as a rule, they are not larger than a cherry.

In most cases, a single aneurysm is found, but it is not uncommon to meet with three or four, and in one remarkable instance the writer found as many as twenty-two aneurysms in one lung. Aneurysms are rarely found except in chronic cavities, the vessels becoming more rapidly obliterated when excavation is acute, though exceptions to this rule are not wanting. In a few instances aneurysms of the pulmonary artery have been seen bulging into dilated or ulcerated bronchial tubes. In one case of ulcerative endocarditis in a young woman, affecting both the right and left sides of the heart, the writer found an embolic aneurysm of a secondary branch of the pulmonary artery without any corresponding vomica in the lung. The aneurysm contained laminated thrombus, and had not ruptured. With these exceptions, however, excavation of the lung is an indispensable condition for the development of pulmonary aneurysms, the nature of the disease on which the cavity depends being immaterial.

Aneurysms may undergo thrombosis and

become occluded, or they may rupture and give rise to hæmorrhage.

It is not unusual to find aneurysms completely thrombosed or still patent without any evidence of rupture having occurred. In such cases there is generally considerable thickening of the dilated vascular wall, but where rupture has occurred, thickening, as a rule, is only slight.

Evidence of rupture and subsequent repair is by no means rarely obtained in cases where hæmoptysis has ceased some time before death.

On examining the bodies of persons who have died of hæmoptysis, we find blood in the air passages and pulmonary cavities, and frequently in the stomach also. The lungs are studded with numerous dark-red patches, consisting of blood inhaled into the terminal bronchi and pulmonary lobules. In eighty cases of fatal hæmoptysis examined by the writer a ruptured aneurysm of the pulmonary artery was found in seventy instances.

There appears to be good reason for believing that profuse hæmoptysis, which does not prove fatal, is in most cases the result of pulmonary aneurysm, and in a much smaller number of instances is due to erosion of a large vessel. The same explanation probably holds good for many slight attacks also. The notion that blood effused into the lung may give rise to inflammatory and destructive processes is quite opposed to the results of experiment, and is no longer entertained. The pyrexia which sometimes appears a few days after an attack of hæmoptysis was held to support the view just mentioned; but this is more readily accounted for by the insufflation of infective cavity secretions, together with the effused blood, into distant parts of the lung, giving rise to the development of specific broncho-pneumonic lesions.

Death may in rare cases be due to syncope; but, as a rule, the amount of blood lost is insufficient to account for the fatal termination, which is really suffocative, and depends on the widespread obstruction of the smaller bronchi and air vesicles, caused by the inhaled blood.

Capillary hæmorrhages from the bronchi, trachea, and larynx are not very uncommon, but profuse hæmoptysis depending on affections of these parts is one of the rarest occurrences, and is more likely to result from cancerous or syphilitic ulceration than from tuberculous disease.

In one instance, profuse and fatal

hæmoptysis was found by the writer to be due to perforation of a large pulmonary artery by an ulcer of the bronchus, caused by the pressure of a calcareous bronchial gland. Direct injury to the lung may be mentioned as an occasional cause of hæmoptysis.

Symptomatology.—Hæmoptysis is occasionally preceded by signs of excitement of the circulation, but, as a rule, the attack is quite sudden, and not unfrequently takes place in the night. Exertion and mental agitation appear to precipitate the hæmorrhage in a few instances; more often, however, no exciting cause can be discovered. The quantity of blood expectorated may be very small, or as much as two pints may be lost within a short space of time. The blood is generally bright red and frothy, and is often mixed with sputum. Occasionally it is dark and venous in appearance in cases of profuse hæmorrhage from the pulmonary artery. When bleeding has been going on slowly for some time, the blood collects in pulmonary cavities, and acquires a blackish-red or chocolate colour. Clots are often expectorated, especially as the attack is passing off. The sputum usually remains blood-stained for some days after active bleeding has ceased. A recurrence of hæmorrhage after apparent cure is by no means uncommon. During an attack of hæmoptysis the patient almost always exhibits great apprehension, and feels weak and faint. The face is pale, the extremities cold, the pulse is small and feeble, and blood is brought up at intervals, with a frequent short cough. At times, blood coming from the lung is swallowed and subsequently vomited. The temperature is lowered while the hæmorrhage lasts, but it soon regains its former level, and in some cases a marked rise occurs within the next two to five days. The cause of this febrile movement has already been referred to. Patients are usually much debilitated and depressed after a fit of hæmoptysis, a result which cannot generally be traced to the amount of blood lost, but is attributable rather to the mental shock produced by the attack.

Diagnosis.—The diagnosis of hæmoptysis during the attack presents little difficulty. The expectoration of bright frothy blood and the short frequent cough clearly point to the respiratory organs. In hæmatemesis the blood is dark and grumous, and is often mixed with the contents of the stomach, which give it an acid reaction. Moreover, it is

vomited, not coughed up, and, as a rule, a large quantity is voided at a time, and successive attacks do not occur. In both forms of hæmorrhage, however, blood may be vomited and passed by the bowel, the explanation being that in hæmoptysis the blood has been swallowed during the attack. As long as hæmoptysis continues, and for some little time afterwards, it is better to abstain from physical examination of the chest altogether. At the most we may auscultate the front of the chest without moving the patient, and without requiring him to breathe deeply.

Excluding cases where the disease is advanced, not much information is obtained from superficial examination of the lungs, owing to the presence of blood in the bronchial tubes. Moreover, we not unfrequently fail to discover any definite signs of pulmonary disease on making the most careful examination of persons who have recently had profuse hæmoptysis. This is especially the case where hæmoptysis is the first tangible symptom, the so-called "phthisis ab hæmoptoe." The explanation of this fact is probably to be found in the existence of circumscribed deeply seated tubercular masses, or even small cavities, surrounded by spongy lung tissue, which masks their presence altogether.

The diagnosis of hæmoptysis, so obvious when the attack is actually witnessed, is not always easy when the patient is seen for the first time a week or more after the hæmorrhage has occurred, for here we have to trust largely to the patient's own account of the accident. Careful inquiries should then be directed to the following points:—The nature of the attack, character of the blood, subsequent staining of the sputum, presence or absence of pulmonary symptoms. In most instances the information thus obtained, when combined with a careful examination of the chest, will suffice to settle the question. But in cases with a doubtful history in which physical exploration gives a negative result, and pulmonary symptoms are absent or slight, it may be impossible to determine the origin of the hæmorrhage, especially when the amount of blood lost is small (*see* HÆMATEMESIS).

If the patient be liable to epistaxis, or bleeding from the gums, the difficulty is still greater. In cases of this description the general condition of the patient, the presence or absence of pyrexia and wasting, the family history, and the examination of the sputum for

tubercle bacilli are points which may supply useful information.

When there is reason to suspect that hæmoptysis is false or spurious, the nasopharynx and cavity of the mouth must be carefully inspected, as blood escaping from these parts, especially during sleep, is liable to trickle into the larynx and trachea. Anæmic girls often complain of their mouths being "full of blood" in the morning; others say that they find blood on their pillow on waking. This sometimes appears to be due to oozing from spongy gums, but in other cases the "blood" found on the mouth proves to be simply a brownish deposit on the teeth and gums, representing secretions that have become dried in consequence of the habit such patients often have of sleeping with the mouth open.

In persons with a clear history of syphilis in whom the absence of morbid physical signs and of constitutional symptoms seem to preclude the idea of pulmonary disease, the possibility of syphilitic ulceration of the larynx, trachea, or bronchi should be kept in mind, and careful examination with the laryngoscope must be instituted.

Prognosis.—The prognosis depends not only upon the severity of the hæmorrhage, but also upon the extent of the pulmonary lesion. If there be reason to think that hæmoptysis is due to early phthisis, the patient may be expected to recover from the attack, as death in such circumstances is extremely uncommon. But where confirmed pulmonary disease is present, the possible existence of an aneurysm renders an accurate prognosis impossible, and a guarded opinion should always be expressed. Profuse hæmoptysis is practically always the result of some disease of the lung, and, with rare exceptions, that disease is tuberculous.

Treatment.—In the treatment of hæmoptysis it is important to remember that pulmonary hæmorrhage is the result of two main conditions—hyperæmia and perforation of vessels.

In the first case, the bleeding is seldom profuse, and tends to relieve the morbid state on which it depends.

In the second and more important class, in which life may be directly endangered, the blood comes from vessels, often of considerable size, which have invariably undergone structural changes. The natural method of cure in these cases consists in the formation of a thrombus, sealing up the rent in the artery, or obliterating its lumen altogether. It is

evident, therefore, that reduction of blood-pressure and slowing of the circulation in the pulmonary artery—conditions which favour the establishment of thrombosis—are the principal objects to be aimed at.

The faintness produced by copious hæmorrhage in itself contributes to this end, owing to the depression of the heart's action which accompanies it, and is consequently to be encouraged.

In every case of hæmoptysis, whether profuse or slight, complete rest is of the first importance. The patient must be kept in bed in a cool airy room, and should avoid talking and movement of any kind. Iced milk may be given in small quantities, but no other form of food is to be allowed, and stimulants should be expressly forbidden. Cough may often be relieved by the continuous sucking of small pieces of ice. When hæmoptysis is slight, no further treatment is required. In the case of serious hæmorrhage, the above measures must be supplemented by the administration of suitable drugs. In the selection of these we are met by many difficulties, owing to the fact that remedies like digitalis, which slow the circulation, at the same time raise the blood-pressure. On the other hand, some of the most powerful depressors of arterial tension, *e.g.*, nitrite of amyl and nitroglycerin, cause excitement of the heart's action.

Saline purgatives, which cause determination of blood to the intestine, and thereby lower the blood-pressure, are free from the above objections, and are often of considerable service, though their action is rather slow.

The cough which is excited by the presence of blood in the bronchi is a great source of danger, in consequence of its disturbing effect on the lung. If the sucking of ice fail to give relief to this symptom, opium in some shape is called for. This drug not only gives local rest to the ruptured pulmonary vessels, but it also quiets the restlessness of the patient which is often so pronounced a feature. Moreover, there is some reason to think that opium is possessed of hæmostatic properties. At the same time, death from hæmoptysis being more often due to asphyxia than to loss of blood, it must be allowed that the sedative influence of opium on the respiration may sometimes be injurious.

The hæmostatic action of oil of turpentine and tartar emetic are probably to be attributed to their depressing action on the heart.

Ipecacuanha in nauseating doses, recommended so strongly by Trousseau, induces faintness, and seems to act in a similar manner to turpentine; but its tendency to occasion vomiting constitutes an objection to its use.

Styptic medicines, such as gallic acid, lead and ergot, which are supposed to arrest hæmorrhage by causing vascular contraction, are more generally used than any other remedies at the present day, though the reasons given for their use are not very convincing.

It is difficult to believe that vaso-constrictive drugs can be of service in profuse hæmoptysis depending on perforation of vessels, seeing that in these cases the contractility of the muscular coat must be either abolished or seriously impaired.

On the other hand, the rise of blood-pressure entailed by arterial contraction, and the constipation which is always produced by astringents, must be regarded as undesirable results.

Ergot is said by some writers to cause dilatation of the veins, and thus to reduce the arterial tension, but, whether this be so or not, the action of ergot is as uncertain and unsatisfactory as that of other styptics. The powerful effect of ergot in controlling bleeding from a contractile organ like the uterus cannot be expected in the case of hæmorrhage from the lung, which is unprovided with muscular tissue. Inasmuch, therefore, as tangible objections exist to the use of styptics, it seems preferable to attempt to lower the blood-pressure by rest, low diet, and saline purgatives, combined, if necessary, with opium. A mixture containing sulphate of magnesia 60 grains, with sulphate of soda 20 grains, may be given every four hours till looseness of the bowels is produced, the same remedy being continued for a few days in less frequent doses, so as to maintain a watery flow from the intestine.

If cough or restlessness be troublesome, morphine in small repeated doses should be administered by the mouth; or, better still, $\frac{1}{2}$ grain of the drug may be injected under the skin. Turpentine is sometimes useful, $\frac{1}{2}$ drachm of the oil being followed by a few doses of 20 minims at intervals of two or three hours.

Tartar emetic in doses of about $\frac{1}{2}$ grain is recommended by some physicians.

If styptics be preferred, the following drugs are those commonly used:—Ergot, in the form of the liquid extract, 1 to 3 drachms, followed by 20 minims every half-hour or hour for a few doses; or

ergotin, 1 to 2 grains hypodermically; gallic acid, 20 grains every hour or two; acetate of lead, 3 grains every three hours; sulphuric acid, 30 minims, in combination with alum, 20 grains, every three or four hours.

The constipation commonly produced by astringents must be obviated by the use of purgatives. Counter-irritation to the chest wall may be employed as an adjunct to other measures. The use of the ice-bag, so popular in Germany, does not find much favour in this country.

The artificial production of pneumothorax has been practised in persistent hæmoptysis with the view of causing collapse of the lung and pressure on the bleeding vessels.

The probable existence of pleuritic adhesions and of consolidation of the lung at the seat of hæmorrhage, the possibility of puncturing the wrong side, and the shock entailed by the operation are among the objections which seem fatal to the adoption of this heroic measure.

Great care is needed in the resumption of exercise, ordinary diet, and stimulants, owing to the tendency of hæmorrhage to return. The patient should be confined to bed, on a very sparing diet, as long as blood continues to be expectorated.

In cases of false hæmoptysis dependent upon oozing from the gums or upon naso-pharyngeal hæmorrhage, local astringent applications should be combined with the treatment of anæmia or other disorder of the general health.

PERCY KIDD.

HÆMORRHOIDS (Piles).—Local enlargement and varicosity of the hæmorrhoidal veins.

When formed by dilatation of the veins which underlie the mucous membrane within the external sphincter ani muscle, they are termed *internal piles*; when formed external to that muscle, and therefore covered with integument, they are called *external piles*.

Hæmorrhoids from which blood is discharged are often spoken of as *bleeding piles*; and those which do not bleed as *blind piles*; when existing in a painless condition they are described as *indolent*.

External Hæmorrhoids, when in an active state, appear as softish, rounded tumours of the integument at the verge of the anus, livid in hue, and tender to the touch. When the congestion is increased, as by the passage of a costive motion, the pile becomes more swollen, tense, and tender. This congestion may

subside, and the contained blood-clot—which is formed at an early stage of the process—may be gradually absorbed, so that the site of the pile becomes occupied by a flattened, more or less plicated, and almost insensitive, fold of hypertrophied integument. Or the congestion may run on into inflammation, with a corresponding increase in the size, redness, tension, and tenderness of the tumour; and this inflammatory condition may undergo remission, with subsequent recurrence from time to time, or may completely subside, with the result already indicated. Or, again, an inflamed pile may suppurate, the little abscess bursting with a discharge of mingled blood and pus, and eventually healing with obliteration of the enlarged vessel and consequent cure of the local mischief.

Bleeding is quite exceptional in the case of external piles.

Internal Hæmorrhoids often fail to attract the patient's attention until they have grown into tumours sufficiently long to protrude at the anus during defæcation. They then appear as one or more tumid swellings of the mucous membrane, which, if the piles be inactive and the sphincter relaxed, present as softish tumours with a granular surface. If congested, inflamed, or strangulated by the sphincter, they appear as protuberant, dark red, tense, smooth-surfaced tumours, painful, and bleeding readily. Large internal piles of old standing often induce more or less eversion of the anal margin, and in such cases it is important not to mistake the encircling ring of everted skin for external piles, as its excision is apt to be followed by troublesome contraction of the anus.

Large internal piles which have protruded beyond the sphincter muscle are liable to become constricted and *strangulated*; an extremely painful congestion and inflammation follows, which may result in the gangrene and sloughing off of the more external portion of the tumours thus affected.

Sometimes internal piles are more sessile in character, existing mainly as flattened nœvoid swellings of the mucous membrane, and rarely or never protruding beyond the anus.

Internal piles are very prone to bleed, especially when to their congestion is added the local irritation caused by the passage of bulky and constipated motions. The amount of blood lost at stool may vary from a few drops to as much as several ounces; it may occur

only at the time of defæcation—and in this respect may be quite irregular, or may exhibit a marked tendency to periodical recurrence or to periodical increase. Sometimes the hæmorrhage takes place within the bowel, quite independently of defæcation. The blood lost is often dark and venous in character. But the longer a pile exists in an active state, the more dilated do all the blood-vessels within it and its immediate neighbourhood become; and in such cases arterial hæmorrhage, even to the forcible spouting of bright red blood, is both common and severe.

Both internal and external hæmorrhoids may co-exist in the same individual.

Symptoms.—*External Piles* are accompanied by a sensation of tenderness, heat, and irritation at the anal margin. When congested or inflamed, the feeling of heat and pain becomes proportionately increased, and renders sitting uneasy or even intolerable. At the same time there is apt to be more or less of the malaise and general irritability of temper or despondency which is usually experienced in connection with a congested state of the portal system.

Internal Piles, during the earlier stage of their development, may be productive of no appreciable symptoms, or, at most, of some sense of fulness and uneasiness within the rectum, and occasional or persistent pain in the back.

The next stage is marked by the occasional loss of small quantities of blood during or after the passage of a constipated motion, and increased heat and irritation just within the orifice of the bowel. Then the piles begin to protrude during defæcation, but return within the sphincter again on completion of the act. Later, they always protrude at stool—and to a greater extent—and their return within the bowel needs to be assisted with the fingers; they also bleed more readily and to a larger amount.

Finally, as the mucous membrane becomes more hypertrophied and the sphincter muscle more relaxed, the anus tends to become everted, sore, and inflamed, and the piles constantly protrude whenever the patient assumes the erect, or even the sitting, posture: while abrasion and irritation of the everted tissues induce a constant muco-purulent and sanguinolent discharge which stains the patient's linen. Defæcation becomes exceedingly painful and there is often more or less irritation about the neck of the bladder, or of the uterine system.

All these symptoms are aggravated—

as, at first, they are only experienced—after any excess at table, or in alcohol, or by some similar imprudence which induces local congestion and spasmodic contraction of the sphincter.

If hæmorrhage occur to a marked extent, or be frequent or continuous, the patient's complexion becomes pallid or sallow, and he may exhibit all the symptoms of profound anæmia (*q.v.*).

Ætiology.—Some persons seem to exhibit a constitutional, and others possibly an hereditary predisposition to the development of piles. This is directly favoured by all conditions that impede the portal circulation and determine a flow of blood to the intra-pelvic organs—*e.g.*, sedentary habits, overfeeding and overdrinking, sexual excess, urinary disorders, flexions of the uterus, pregnancy; cardiac, respiratory, and hepatic disease; local chill, constipation, violent purging, and the abuse of aloetic aperients.

The malady is exceptional before puberty, but is rarely altogether escaped in later years, and is common in middle and advanced life. Men suffer more than women; but women who have borne children are, for obvious reasons, liable to the development of piles.

Treatment.—If the portal system be congested, it should be unloaded by a mild mercurial cathartic; and the action of the bowels must be so regulated that they are every day *sufficiently* relieved by the easy passage of a softish motion, but without any intestinal irritation or excessive purging. The confections of senna and of sulphur, the compound liquorice powder, or a dose of aperient mineral water taken every morning on rising, are suitable to this end.

The patient should take abundant exercise in the open air, and must use cane- or wood-seated chairs, avoiding all softly cushioned seats. Rich and highly seasoned dishes as well as alcohol must be abstained from; and the abdomen, legs and feet should be warmly clothed.

Eight or ten ounces of cold water injected into the rectum every morning is a very useful measure; and some astringent—such as ice, tannic acid, rhatany, hazeline, or alum may be added to the water, if advisable, in order to control venous bleeding; or an astringent suppository may be used. The orifice of the bowel should be cleansed with cold water after each defæcation, and any protruding piles should be at once pressed back within the sphincter by the fingers smeared with simple oil, or anointed with the unguentum gællæ cum

opio, or with an ointment containing cocaine and acetate of lead.

A few 2-drachm doses of the liquid extract of coca leaves will often check the venous bleeding and other symptoms of congested internal piles; and a mixture containing sodium or magnesium sulphate, sulphate of iron, glycerine and dilute sulphuric acid is useful in such cases.

In persons suffering from general plethora, lack of sufficient exercise, excess at table, or from any form of congestion of the liver or kidneys, it is unwise to check completely or too suddenly the venous hæmorrhoidal bleeding, which may serve as a useful safety-valve; and under these conditions a course of alkalies with a little colchicum and careful hygienic management are often all that is needed for gouty subjects. But arterial bleeding from piles is never beneficial to health; nor is it so amenable as the venous variety to merely medicinal treatment.

Whenever hæmorrhoids, be they internal, or external, are very large and troublesome, or the cause of excessive hæmorrhage, they must be treated by surgical operation. External piles may be simply snipped off with scissors and their bases touched with some styptic; or they may be ligated, or injected with carbolic acid liquefied by glycerin. Internal piles are treated by the application of the ligature, or of strong nitric acid, or by the cautery; or they may be crushed by an appropriate clamp.

C. E. SHELLY.

HÆMOSTATICS (Styptics) are remedies used to arrest hæmorrhage. They act either by promoting coagulation of the blood in the vessel, or by causing contraction of the bleeding vessel. To the latter group belong nitrate of silver, acetate of lead, and ergot, the latter or its active principle, sclerotinic acid, being especially useful when given hypodermically; cold and heat are also powerful agents belonging to this class. The other group includes all the substances which tend to promote precipitation of albumen, and so to hasten the coagulation of the blood. They have already been enumerated under the head of Constringents (*vide* ASTRINGENTS).

HAIR, DISEASES OF THE.—Certain affections of the hair are described elsewhere under the headings ALOPECIA and CANITIES. In this article only such diseases are included as are but little likely to be sought for under their proper titles.

Hirsuties (Hypertrichosis) denotes hypertrophy or superabundance of hair.

The affection assumes various forms: thus, normal hairs may increase in size and length, *e.g.*, on the eyebrows, nostrils, ears; or coarse pigmented hairs may grow upon regions normally provided with lanugo.

The development of hair is closely correlated with maturation and disease of the genitalia. In both sexes sexual precocity is accompanied by premature development of pubic and axillary hairs; at the menopause, or in consequence of menstrual disorders, women are often disfigured by growth of hair about the chin and lips, and a similar condition occasionally occurs during pregnancy (*H. gestationis*). The presence of long, coarse hairs on congenital or acquired moles is very frequent. More rarely a temporary hirsuties results from spinal disease or nerve injuries, or from local irritants employed therapeutically.

Certain tribes in Japan (*Aïnos*) are covered with coarse hair. Among Europeans, hirsuties is often hereditary, the teeth being also badly developed; by some, the condition is considered as illustrative of atavism, or reversion of type.

Treatment ought to be directed to the cause. Caustic pastes are sometimes used, but their employment is to be deprecated, as they are apt to produce excessive irritation, and the hair which subsequently appears is generally more abundant and more deeply pigmented than before. Destruction of superfluous hairs by electrolysis is a satisfactory operation in suitable cases—*e.g.*, where the hair is dark and strong, the growth localized and not progressive. A fine needle connected with the negative pole of a galvanic battery is introduced into the hair follicle; the circuit is then closed, slight frothing occurs, and an urticarial wheal forms, from the centre of which the hair, when quite loose, is detached with forceps. The little operation is rather painful. The minute scar which necessarily results ought to cause no perceptible disfigurement. A current strength of 4 to 5 milliampères employed for thirty seconds is sufficient to destroy each hair.

Trichiasis denotes an abnormality in direction of the growth of the hair, most commonly observed in the eyebrows and eyelashes. In the latter situation, the hairs often turn inwards, and cause conjunctivitis. They are best extirpated by electrolysis.

Fragilitas crinium implies brittleness of the hair-shaft, and is a symptom of many diseases, especially those which induce morbid dryness of the skin—*e.g.*, diabetes, seborrhoea, tinea tonsurans. On traction, the hair-shafts are easily fractured. Occasionally, the distal end of the shaft splits, or the hair splits within the follicle and appears on the surface like a minute wisp.

Treatment consists in the use of pomades or simple oils.

Trichorexis nodosa is a disease characterized by brittleness of the hair-shaft and by the development upon it of fusiform, bulbous, nodular swellings of a whitish colour, easily mistaken for "nits." It affects the beard and moustache more frequently than the hairs of the scalp, and causes considerable disfigurement.

The nodal expansions are distributed irregularly along the shaft, the internodal portions of which are quite healthy; at the nodes, the medullary substance is absent, and the cortex is distended and stretched by an accumulation of air. Fracture takes place at the nodes, and the brush-like ends may interlock, maintaining the continuity of the hair, but often at an acute angle. Nothing is known of its ætiology, and even removal of the beard is seldom of avail, the succeeding hair having the same peculiarity.

Another rare variety has been described in which the nodes occur at regular intervals, giving the hairs a moniliform appearance; the internodal portions are much atrophied, and the medulla often absent, and it is here that fracture occurs.

Piedra is a parasitic disease somewhat similar to trichorexis. It is common in Columbia, and affects the hair of the scalp in women. Small, hard nodules surround, or are attached to one side of, the hair-shafts, which on microscopic examination prove to be masses of spores budding forth from one cell. Constant washing cures the condition.

Plica polonica is a matted, entangled condition of the hair, the result of personal uncleanness and the desiccation of accumulated purulent discharges accompanying pediculosis and eczema capitis. It was long considered a mysterious disease of nervous origin.

J. J. PRINGLE.

HALLUCINATION. — Hallucinations are sensory impressions which occur without the action of external stimuli, and must be carefully distinguished

from illusions, which are false perceptions of actual objects. Any of the special senses may be affected, including disorders of the sense of touch, tactile hallucinations, which are comparable to the paræsthesia of such nervous diseases as locomotor ataxy; and visceral hallucinations, which closely resemble the visceral paræsthesiæ of various spinal diseases; also organic sensations, such as nausea or faintness.

Hallucinations of hearing are the most common, and occur chiefly in delusional insanity and melancholia, but also in acute mania, more especially in the alcoholic variety of that disease. Hallucinations of sight are chiefly observed in mania and delirium, and are generally acute and temporary symptoms, whereas those of hearing may last for many years. Hallucinations of these two senses may be unilateral or bilateral, and may be simple, as visions of lines or spots, or sounds, as of buzzing, or complex, appearing as heavenly scenes or the sound of human voices. Hallucinations of taste and smell are generally associated; they are of much less common occurrence, and are of serious import.

GEORGE REVINGTON.

HANGING, DEATH BY.—In carrying out the extreme penalty of the law, owing to the adoption of the "long drop," death is now generally due to pressure upon the medulla oblongata or spinal cord, from fracture or dislocation of one or more of the cervical vertebrae; but in the other forms of hanging it usually results from asphyxia.

The proof that a person has met his death by hanging will depend upon the position of the body when found, the presence of certain external marks on the neck, and of the signs of asphyxia in the internal organs, and on the absence of any other cause of death. The external signs about the neck will depend upon the length of time the body has been allowed to hang after death, and the nature of the suspending cord. The mark on the neck is generally an oblique, hard, dry, yellowish, horny furrow, sometimes marked with superficial ecchymoses. A small ligature will, of course, produce a thin and deep line; when there are two marks, these usually cross, instead of being parallel. Similar appearances result if the body be suspended immediately after death; to prove that this had been done would be almost tantamount to proving that a murder had been committed.

The face is usually turgid, with blood-stained froth about the mouth and nostrils; the tongue is swollen and semi-protruding. In men, the penis is often semi-erect, an escape of prostatic fluid having taken place; in women, the genital organs may be turgid or blood-stained. Internally, the right side of the heart and the lungs will be found engorged with venous blood; the left side may be empty; there may also be fracture or dislocation of the cartilages of the larynx, or fracture of the hyoid bone; sometimes the middle and inner coats of the carotid artery are found to have been divided.

Hanging is generally suicidal; it is by no means necessary that the body should be completely suspended in the air in order that a fatal termination may ensue.

It is rare that an opportunity for *treatment* presents itself; when it does, the body should be immediately cut down, and the rope removed from the neck. A free supply of air and artificial respiration would afford the best prospect of restoring suspended animation; bleeding is sometimes useful.

HAY FEVER (Hay Asthma).—A catarrhal affection of the mucous membrane of the eyes, nose, and air passages, frequently combined with asthmatic paroxysms, and due to the action of certain irritants on an abnormally sensitive mucous surface.

Under this head are included, not only cases of true hay fever, due to the irritation of the pollen of grasses, but also cases of paroxysmal sneezing and vasomotor coryza, caused by the action of various irritants on the nasal mucous membrane.

Symptoms.—The attack may commence with irritation of the conjunctivæ, lachrymation, and an increased secretion from the Meibomian glands; some amount of chemosis is frequently present. There is a feeling of fulness and oppression in the head, pain across the frontal sinuses, and intolerance of light. After an interval of time, varying from a few hours to some days, the nasal mucous membrane becomes affected; or it may be primarily attacked, the affection of the eyes being secondary; in any case, the patient sooner or later complains of intense irritation and stuffiness in the nose, and the mucous membrane may swell to such an extent as to render breathing through the nose very difficult, or even impossible. There is also a profuse discharge from the nose (at first watery, afterwards

becoming muco-purulent), with incessant sneezing. The catarrhal condition may also extend up the Eustachian tubes, giving rise to deafness. In some cases the disease extends down the throat, causing a feeling of dryness and itching in the fauces; and if the bronchial mucous membrane be attacked, there will be cough and a sense of constriction across the chest. Well-marked asthma may accompany an attack such as above described, or it may constitute its chief feature, the symptoms of coryza being less marked.

As regards general symptoms, there may be a slight amount of pyrexia, but it is frequently altogether absent; the pulse is usually somewhat accelerated. The attacks have a depressing influence on the patient generally, and there may be evidences of gastric disturbance. Urticaria is sometimes associated with hay fever.

Diagnosis.—The catarrhal symptoms which mark the onset of the attack, and the occurrence of violent sneezing after exposure to a source of irritation, in typical cases the pollen of various grasses, usually suffice to render the diagnosis easy. The only cases which present any difficulty are those in which symptoms of asthma appear without a previous catarrhal stage; but these may usually be distinguished from ordinary asthma by the fact that the attack occurs by day, and that it can be traced to the inhalation of some irritant or odour.

Prognosis.—The great attention which has been paid to hay fever of recent years has resulted in a much more successful mode of treatment, so that in the majority of cases a cure may reasonably be expected; and even where this cannot be attained, great relief can be afforded.

Pathology.—In discussing the pathology of hay fever it will be necessary to include the subject of reflex nasal neuroses, as it is impossible to separate the one from the other. The writer is satisfied that, although Hack erred in attributing to diseased conditions of the nasal mucous membrane too great a rôle in the causation of various nervous affections, their influence in this respect is considerable. In addition to hay fever, asthma and paroxysmal sneezing, cough, migraine, supra-orbital neuralgia, redness and swelling of the nose, and giddiness have been found to owe their origin in some cases to abnormal conditions of the nose, and it has been shown that preternatural irritability of the Schneiderian

membrane, from any cause, renders it liable to respond to influences which are entirely innocuous to a healthy tissue. This explains the fact that, although thousands are exposed to sources of irritation, such as the pollen of certain grasses, only an exceedingly small number suffer any inconvenience therefrom.

The changes met with in the nose in cases of hay fever are usually of a hypertrophic character, and constitute the condition known as "hypertrophic rhinitis." The whole nasal cavity may be affected, or there may be only a puffy swelling of the inferior or middle turbinated bodies, or a patch of erosion on the mucous membrane. Polypi, and a deflection of the septum nasi, are present in some cases. In a case of prolonged duration, under the care of the writer, all symptoms ceased as soon as a perforation in the septum had taken place, thus apparently proving that the irritable zone from which the reflex stimulus started was situated on the septum. On touching the interior of the nose with a probe, parts of the mucous membrane will often be found to be hyperæsthetic, and it may be possible to start an attack of sneezing in this way. Whatever the local changes may be, a paroxysm of hay fever is invariably accompanied by swelling and engorgement of the erectile tissue, which forms so important an element of the inferior turbinated body, but which is also present in other parts of the nasal mucous membrane. This is followed by an increased secretion, at first purely serous in character, but which later may become muco-purulent.

Ætiology.—In every case of hay fever, at least three factors are concerned in the production of an attack—(1) a general nervous constitution of the individual; (2) a local irritability of the conjunctival or nasal mucous membrane; and (3) some direct exciting cause. As regards the first, it is to be noted that the greatest sufferers from hay fever are the English-speaking peoples, but it is also met with in other races, though much more rarely. An instance of it occurring in a negro has been recorded. As a rule, the victims are persons belonging to the educated classes, whereas labourers almost entirely escape. Inhabitants of towns are more prone to be attacked than country folk. Men are much more subject to the disease than women, and heredity exercises a powerful influence. The second factor has already been considered when speaking of the pathology

of the disease. The remaining factor is the direct exciting cause. Careful and prolonged investigation has shown that, in this country at all events, the pollen of certain grasses is the most powerful exciting cause of hay fever, but it is equally certain that other sources of irritation, such as dust, or even the perfume from some plants, or the odour of certain animals, are capable of starting an attack in those predisposed to it. Again, a bright light, heat, or touching the irritable zone may start an attack.

True hay fever usually begins at the end of May or the commencement of June, and lasts about five or six weeks, or even longer in severe cases.

Treatment.—Bearing in mind the three factors concerned in the production of the affection, it will be desirable, in the first place, to improve the general health of the individual as far as possible. The severity of many cases is aggravated by the injudicious use of stimulants. Doubtless the depression produced by the disease would seem to suggest the administration of alcohol in some form, but when its action in dilating the arterioles is considered, it will be seen that locally its effect is far from beneficial, to say nothing of the more remote evils that may result from its use. Morell Mackenzie speaks highly of 1 grain of valerianate of zinc with 2 grains of the compound assafoetida pill, given two or three times a day. Tincture of opium in 5 to 10 minim doses, either alone or in combination with the same quantity of the tincture of belladonna, has been highly praised. One medical man reports that $\frac{1}{10}$ of a grain of morphine with $\frac{1}{20}$ of a grain of atropine, administered subcutaneously three times a day, robbed the hay season of its misery so far as he was concerned, but the objections to recommending injections of morphine in chronic illness are so weighty that the drug should only be employed as a last resource. Another medical man speaks favourably of his personal experience of succus belladonnæ, $\frac{1}{2}$ drachm being added to 3 ounces of water, and a teaspoonful taken every hour until the symptoms are relieved; the same solution may be used as a lotion for the eyes. Bromide of potassium (10–20 grs.) with 3 minims of liquor arsenicalis is useful for allaying the nervous erethism met with in hay fever, while at the same time the arsenic has a tonic effect. Antipyrin in 10 to 30 grain doses twice a day has an excellent effect—it seems to have an anæ-

sthetic action on the sensory and secretory nerves of the nasal fossæ.

The second point to be considered is the removal of the patient from the exciting cause of the paroxysm. Many persons who suffer severely in the country are almost free from attacks at the seaside. A sea voyage, if time can be spared for it, generally proves beneficial. But if the individual cannot escape from the country, he should be instructed to wear out-of-doors “goggles” with pale-blue glasses, and, if he will submit to it, a blue silk veil of double thickness over the face. He should take life as quietly as possible, and should especially avoid exertion in the sun. On the least suspicion of the complaint commencing he should bathe the conjunctivæ with a solution of corrosive sublimate 1 in 3000, and the same solution may be cautiously sprayed up the nostrils. Plugging the nostrils with tampons of cotton-wool soaked in glycerin is very useful in some cases. Lastly, the greatest care should be taken to examine the nasal passages with the view to discover the presence of any departure from the normal condition. If a puffy swelling of the turbinated bodies exist, or the mucous membrane be hypertrophied, the use of the galvano-cautery can be highly recommended. The surface is first rendered anæsthetic by dabbing it with a 20 per cent. solution of cocaine. After an interval of five minutes the cocaine may, if necessary, be applied a second time. The galvano-caustic blade should then be drawn along the mucous membrane so as to score it freely, or the fine point may be passed into the tissue in several places. Whichever plan be adopted, as healing occurs contraction takes place, and the undue sensitiveness of the surface is thereby destroyed. More prominent hypertrophied tissue or polypi may be removed by the galvano-caustic loop. Similar procedures will be found of great service in cases of paroxysmal sneezing and other neuroses starting from the nasal mucous membrane. As regards the use of cocaine locally, the expectations which were formed of its efficacy in hay fever when the drug was first introduced have not been realized. Though the immediate effect of the application of a weak solution of cocaine to the nasal mucous membrane is to produce an alleviation of the most distressing symptoms of the disease, the effect soon passes off and the application has to be renewed. As a result of the dilatation

of the blood-vessels which is the secondary effect of cocaine, the mucous membrane increases in thickness, so that eventually cocaine aggravates the evil it was meant to cure. Moreover, the seductive effect of the drug should not be forgotten, nor the risk of starting the cocaine habit ignored. A 10 or 20 per cent. solution of menthol dissolved in almond or olive oil and applied to the nasal mucous membrane has yielded good results, and has none of the drawbacks of cocaine. Sir Andrew Clark has proposed a plan of treatment by which the irritability of the nasal mucous membrane is exhausted. An ounce of glycerin of carbolic acid, 1 drachm of hydrochlorate of quinine, and a two-thousandth part of perchloride of mercury are made into a solution by the aid of heat, and the interior of the nostrils is freely swabbed out with the mixture. He claims a fair measure of success for this plan—*i.e.*, about half of those whose cases he was able to follow were cured for the season, and four persons were cured "for good." If a more radical treatment be out of question, or be objected to by the patient, anointing the interior of the nose with an ointment consisting of 1 ounce of vaselin and a drachm of oil of eucalyptus, with or without a drachm of the solution of atropine B.P., as suggested by Lennox Browne, will be found useful. Among minor remedies which have been found of use in alleviating some of the symptoms of hay fever may be mentioned carbolized smelling salts, the formula for which is pulv. carbonis ligni; ammon. carb., āā ʒij; tr. benzoini co., ʒj; acidi carbolic, ol. lavandulæ, āā ℥x; liq. ammonii fort., q.s.; misce bene; also the inhalation of benzoin, a drachm of the tincture in a pint of hot water, and the use of a spray of a 25 per cent. solution of rectified spirit.

F. DE HAVILLAND HALL.

HEADACHE (Cephalalgia) is a symptom occurring in the course of a great variety of diseases. It may be due to organic cerebral disease, congestion and anæmia of the brain, functional nervous disorders, toxæmic conditions and derangements of the stomach and liver. The character of the pain varies considerably; it may be superficial or deep, constant or paroxysmal, general or local, dull and heavy or throbbing and stabbing.

Headache is frequently the first symptom and occurs in nearly every case

of meningitis, and of tumour or abscess of the brain. The pain is rarely paroxysmal, but usually constant and liable to exacerbations, which may be of the most excruciating description. It is frequently circumscribed, but is of little or no localizing value unless the lesion be superficial. In some cases of syphilis of the meninges or cortex, and of superficial abscess, pain is referred to a spot which is extremely sensitive to pressure. On the other hand, the seat of the pain may be far distant from the lesion—so far, indeed, that frontal headache has been known to occur in disease of the occipital lobes. On the whole, pain referred to the occiput is of far more diagnostic importance than if it be frontal.

Headache also occurs in many functional nervous disorders. One of the commonest of these is migraine, which will be found discussed under that head. It need only be said here that there are many imperfectly developed forms of that affection, and that headache unaccompanied with vomiting or any sensory disturbance is one. Among hysterical women and highly strung, sensitive, emotional people, and especially girls, who are perhaps also precocious, headache is a common symptom, and may resist every form of treatment. In these cases there is often a neuralgic element, which, if not the source of the headache, gives it a distinct colouring, and justifies its name of neuralgic headache. The pain may be general or local, is not paroxysmal, and may persist for days. Hysterical women sometimes experience a vertical headache, which is usually described as boring, and like that which might result from the driving of a nail into the top of the head. It thus receives the name of "clavus hystericus."

Headache is common in cases of nerve exhaustion proceeding from almost any cause, and particularly from prolonged mental effort or worry. It may be a result of anæmia, and is then commonly frontal, or may be due to congestive states of the brain resulting from heart disease, asthma, and other forms of dyspnœa. In these latter cases it is throbbing in character, and, as in nearly every other variety of headache, is increased by stooping, coughing, and any other condition which tends to increase the congestion.

Frontal headache is frequently the result of errors of refraction, especially hypermetropia and astigmatism. In

many of these cases there is occipital pain of a neuralgic nature, and sometimes a painful area on the scalp, the hair of which feels as if it had been "slept on the wrong way."

Toxæmic headache may result from chronic alcoholism, uræmia, lithæmia, fevers, secondary syphilis, or diabetes. In most of these cases it is frontal and deep-seated, and is sometimes very severe; in uræmia, indeed, it may be so overwhelming as to raise the suspicion of cerebral tumour. That of secondary syphilis is of the neuralgic type, limited to the temples, and recurring with great regularity every evening. In lithæmic subjects indiscretions of diet or constipation may induce headache, which, coming on in the morning, may last a short time or persist for days. Badly ventilated or overcrowded rooms, in which respired air is necessarily breathed, readily produce, in many people, a heaviness or actual pain in the head. The same thing is often experienced before a thunderstorm, when the air is so still that the products of respiration are not carried away. Headaches resulting from stomachic and hepatic derangements are possibly also toxæmic in origin. They are usually occipital or vertical, but may also be frontal or generally distributed.

Treatment.—This must be mainly directed towards the condition which is the cause of the headache. Little can be done to alleviate the agonizing pain of organic cerebral disease other than syphilitic. If narcotics be prescribed, it should be remembered that sudden death is by no means rare in these cases, and may possibly be ascribed to the drug if no warning have previously been given to the patient's friends. Toxæmic headache is often relieved by diuretics and mild aperients. Anæmic states must be treated with iron, and in these and some other cases arsenic is also of use. In all cases of doubtful origin the eyes should be examined, and any error of refraction remedied by the use of spectacles. The instillation of atropine into the eyes for a week or two is of great service when the headache depends upon spasm of the ciliary muscle. Paroxysmal and neuralgic headaches should be treated on the same principles as neuralgia. In these the administration of quinine, arsenic, gelsemium, butyl-chloral, cannabis indica, and antipyrin meets with success in different cases, but, in addition, the general surroundings and habits of the patient must be carefully considered. Local applications are

of comparatively slight value; but a mustard plaster applied to the nape of the neck sometimes greatly relieves an occipital headache, and menthol and stimulating liniments, such as chloroform, belladonna, or aconite, are occasionally distinctly beneficial.

WILLIAM GAY.

HEART, DISEASES OF THE MUSCULAR WALLS.—The diseases of the cardiac walls, viewed from the standpoint of pathological anatomy, are many and various, including degenerative, inflammatory and suppurative affections, fatty infiltration, simple atrophy and morbid growths of different kinds. In addition to these well-recognized conditions, it is probable that the myocardium and its nervous apparatus are liable to fine molecular changes, which cannot as yet be precisely defined, but which may constitute the starting-point of certain forms of dilatation and failure of the heart and of some of the so-called functional disorders of the organ.

The degenerative group comprises granular, fatty, fibrous, amyloid, pigmentary, vitreous and calcareous transformations.

Myocarditis, or acute inflammation, evinced by a cellular exudation, is practically always consecutive to pericarditis or endocarditis, but is said to have been found without concomitant disease of the pericardium or valves in isolated instances.

Abscess of the heart's wall is usually multiple, and is a symptom of pyæmia or allied conditions, such as ulcerative endocarditis, in which minute infective emboli become impacted in the branches of the coronary arteries.

The morbid growths to which the heart is liable are carcinoma, sarcoma, lympho-sarcoma, lipoma, myoma, fibroma, myxoma, tubercle, syphilitic gummata, hydatid cysts and cysticercus. Malignant growths are almost invariably secondary to similar disease within the thorax or in other parts of the body, though instances of primary sarcoma and lympho-sarcoma have been recorded. The commonest forms of morbid growths are secondary carcinoma and tubercle, the latter being associated, as a rule, with pericardial tuberculosis. All other growths are extremely rare.

Simple atrophy of the heart may occur in many different diseases, but is devoid of any special clinical significance.

Morbid conditions of the cardiac walls are only of clinical importance in so far

as they lead to interference with the functions of the heart. Lesions of the myocardium, of whatever kind, when they are of sufficient degree and extent, have as their necessary consequence impairment of the heart's contractile power.

In the present state of our knowledge it is in most cases impossible during life to differentiate with any degree of accuracy the various morbid changes to which the myocardium is liable. Our recognition of these affections is based partly upon the effects which they produce on the heart itself and on the peripheral circulation, and partly on a consideration of the general condition and history of the individual patient. By this means we are at times enabled to diagnose the disease; nevertheless, though we may suspect the presence of a certain lesion, and may happen to be right occasionally, we can seldom arrive at an accurate anatomical diagnosis.

In this article the general pathology of disease of the cardiac walls will be first considered, those affections which seem to require special notice, such as **FATTY and FIBROID DISEASE, DILATATION and HYPERTROPHY FROM OVERSTRAIN**, being treated separately.

GENERAL CONSIDERATION OF MYOCARDIAL DISEASE.—Impairment of the heart's contractile power, as shown by cardiac weakness or insufficiency, is the fundamental point from which our diagnosis must start in all myocardial affections.

Dilatation.—As a necessary result of muscular weakness, the walls of the heart yield to the intra-cardiac blood-pressure, and some or all of the chambers undergo dilatation according to circumstances. Such dilatation must be distinguished from the temporary distension which is the consequence of physiological increase of the heart's work. A rise of tension in the systemic arteries, induced by muscular exertion or other causes, leads to heightened pressure in the left ventricle in the first instance, but this condition soon reacts backwards on the left auricle, the pulmonary circulation and the right heart, the result being a general increase of intra-cardiac pressure. The moderate distension of the heart induced by physiological causes is unaccompanied by any failure of the circulation, for the heart is possessed of a remarkable fund of reserve force, which enables it to meet increased demands on its functional activity within very wide limits. When the cause of the increased intra-cardiac pressure is removed—for example, when

violent muscular exercise is discontinued—the heart regains its normal size without any resulting deterioration of its muscular fibres.

Pathological dilatation differs from physiological distension in that it entails some degree of disturbance of the circulation. In this instance the enlarged condition of the cardiac chambers is more or less persistent, the cause being abiding, as in the case of extensive myocardial degeneration or valvular disease; or, if temporary, acting with great intensity—for example, the dilatation due to overstrain of the heart.

The development of pathological dilatation may be associated with gross changes in the muscular tissue of the heart, such as fatty degeneration; but more often no anatomical alteration can be detected with our present appliances. It is probable, notwithstanding, that some subtle molecular changes are intimately connected with the occurrence of dilatation. No sharp line of distinction can, however, be drawn between slight degrees of pathological dilatation and physiological distension. Enlargement of the heart's cavities probably represents an exaggeration of the normal state in each case.

Experiments on the healthy living heart (Roy and Adami) have shown that, although the greater part of the ventricular cavity is obliterated during systole, a certain amount of blood always remains in the upper part of the chamber, between the valves and the papillary muscles. When the resistance to the discharge of blood from the left ventricle into the arteries is increased, the amount of this residual blood becomes larger, and the ventricle now contains more blood during diastole as well as systole. When, as commonly happens at first, the quantity of blood poured into the heart from the veins in a given time remains unchanged, the left ventricle at the end of diastole contains the normal quantity received from the auricle and lungs, plus the increased residual blood that remained in the ventricle at the close of the previous systole. Enlargement of the ventricular cavity is, therefore, a necessary consequence.

This diastolic distension may be temporary or persistent. If the reserve force of the cardiac muscle be not exceeded, the quantity of blood discharged from the ventricle at each systole suffers no important diminution, and no circulatory derangement occurs. When, on the other hand, the mechanical work required of

the heart reaches a certain point, which differs widely in individual cases, the limits of the heart's power of accommodation are exceeded. The ventricle can no longer sufficiently empty itself into the arterial system owing to exhaustion of its muscular fibres, and the amount of blood discharged at each systole falls below the normal. The cardiac walls yield to the internal pressure, and blood gradually accumulates in the distended ventricle, with consecutive dilatation of the left auricle and right heart.

When the engorgement becomes excessive, the muscular fibres of the auriculo-ventricular rings become stretched, the less yielding mitral and tricuspid curtains no longer completely close the dilated orifices, and regurgitation ensues. The immediate effect of dilatation of the left ventricle is seen in incomplete filling of the arteries, owing to the feeble contraction of the muscular walls. This diminution of the driving power of the ventricle is speedily followed by backward congestion, reacting first on the lungs, and subsequently on the right heart and veins of the systemic and portal circulation.

Dilatation of the heart may be due to increased work, or to changes in the muscular walls tending to impair their contractility. The work of the heart may be raised by an increase in the volume of blood which it has to discharge in a given time, or by increased peripheral resistance in the arteries or capillaries.

The left ventricle has been taken as a type of the heart generally; but what has been said of this chamber applies with equal force to the heart as a whole.

In the preceding remarks enlargement of the heart's cavities has been alone considered, but it is in all probability true that pathological dilatation is always accompanied by a varying amount of hypertrophy of the muscular walls.

Hypertrophy is generally divided into three classes—(1) simple hypertrophy, where the walls are thicker than usual, the size of the cavities remaining unchanged; (2) concentric hypertrophy, where the size of the heart remains the same, but its walls are increased in thickness and encroach upon the capacity of its chambers; (3) excentric hypertrophy, where the heart is both dilated and hypertrophied.

Simple hypertrophy is perhaps found in some cases of renal and other diseases, but excentric hypertrophy is the condition almost always met with. The ex-

istence of concentric hypertrophy is very doubtful. Many fallacies arise on the post-mortem table, not only in estimating the relative degree of hypertrophy and dilatation, but even in determining the very existence of these conditions. The varying amount of "rigor mortis" or relaxation met with in different cases is a fruitful source of error, and an accurate decision is at times impossible. The weight of the heart is probably the best test of hypertrophy that we possess. Increased thickness of the heart's wall is mainly, if not entirely, the result of a numerical hypertrophy of the muscular fibres, though a few authors have contended for the enlargement of the primitive fibrils.

Some writers divide hypertrophy into two further categories, *true* and *false*. In true hypertrophy the muscular tissue itself is increased, whereas in the false variety the thickening is due to some extent to an adventitious fibrous growth. In speaking of hypertrophy we shall refer to true hypertrophy only.

The origin of hypertrophy is to be sought in every case in some increase in the work required of the heart. A rise of arterial pressure representing augmented resistance to the ventricular discharge must therefore tend to produce hypertrophy. Taking the left ventricle as a type, we have seen that increased peripheral resistance in the arteries involves enlargement of this chamber. As the ventricle must now contain a larger amount of blood, more powerful contractions are required to propel its contents; in other words, the work of the ventricle is increased. Thus it appears that dilatation is indirectly a cause of hypertrophy. Valvular defects also throw extra work on the heart, and are prolific sources of hypertrophy and dilatation.

When a hindrance to the circulation occurs in the systemic arteries and capillaries, or in the aorta itself, the walls of the left ventricle and auricle undergo an increase in thickness in the first instance, though eventually a certain degree of hypertrophy is manifested by the right heart also.

The main causes of hypertrophy of the left heart are—(1) certain valvular diseases; (2) diseases of the aorta and its branches, involving loss of elasticity of their coats, which may or may not be associated with narrowing or dilatation of their lumen; (3) diseases of the kidney, especially cirrhosis; (4) stenosis or coarctation of the aorta at the point of entry of the ductus arteriosus; (5) general

contraction of the arterioles from prolonged muscular exercise or from other causes.

The causes of hypertrophy of the right side of the heart are to be found in conditions that occasion obstruction to the pulmonary circulation, or that interfere with the passage of blood through the right heart, viz., certain valvular affections, and chronic diseases of the lungs, *e.g.*, emphysema, cirrhosis, collapse and phthisis.

The following doubtful causes of hypertrophy of the heart may be mentioned:—Plethora or an increase in the volume of blood, pregnancy, over-action of the heart from nervous causes, and adherent pericardium. The last condition is considered under the head of PERICARDITIS. For the development of hypertrophy certain conditions are required in addition to increased work. In the first place, an adequate circulation of healthy blood through the coronary arteries is of vital importance for the nutrition of the myocardium. In wasting diseases, such as carcinoma and phthisis, the mechanical conditions necessary for the development of hypertrophy may be present without any corresponding increase in thickness of the cardiac walls, owing to the impoverished state of the blood. It is obvious that hypertrophy once established will itself tend to promote a more rapid and copious flow of blood through the coronary arteries. Secondly, distension of the heart's cavities must not be too sudden or excessive, the effect of this being seen in a paralytic dilatation of the heart, as is the case in asphyxia.

Hypertrophy, being the result of increased demands on the heart's functional activity, is essentially a conservative process. The strengthening of its muscular power enables the heart to overcome in a greater or less measure the obstacles which have called forth the hypertrophy. Another important and beneficial result of hypertrophy of the cardiac walls consists in an augmented power of resistance to the internal pressure of the blood, which is manifested by a diminution or disappearance of the signs of dilatation. Hypertrophy is therefore fitly described as *compensatory*. The existence of compensation is revealed to us by restoration of the circulation, by certain alterations in the heart itself, and by removal of the consequences of its previous disturbance, such as arterial anæmia, venous stasis, and their effects.

Hypertrophy of the heart may be sufficient or insufficient, but is never excessive—one of the many proofs we have of the complex powers of adjustment possessed by that organ.

The functional effects of dilatation and hypertrophy are combined with certain changes in the heart itself. Dilatation frequently causes thrombosis in the different chambers owing to the slowing of the circulation. Cardiac thrombi sometimes attain to a considerable size, and may give rise to mechanical interference with the blood-stream. More frequently, by detachment of fragments, they afford materials for the production of embolism in other organs. Thrombosis of the right heart is a common source of pulmonary embolism. Fibrinous emboli derived from the left side of the heart may become impacted in the arteries of distant organs, such as the brain, kidneys, spleen, or even of the heart itself. The subject of embolism of the various organs is treated under that heading; the consequences of coronary embolism are described in the article on FIBROID DISEASE OF THE HEART (*q.v.*).

The high pressure which prevails in dilated and hypertrophied hearts leads, in course of time, to more or less fibrous thickening of the valves, papillary muscles, chordæ tendineæ and endocardium, both sides of the heart or only one side being involved according to circumstances. Hypertrophied and dilated hearts are prone to degenerative changes in their muscular walls; parts like the left ventricle, with its papillary muscles, which are most liable to high pressure and whose functional activity is greatest, showing a special tendency to undergo these changes.

Owing to its increased size and weight, the heart is apt to fall downwards and take up a more transverse position, depressing the diaphragm, and interfering with the free action of this important muscle. Respiration is further impeded by the encroachment of the enlarged heart on the intra-thoracic space. Emphysema of the anterior margin of the lungs is not uncommon in such cases, and is partly the result of concomitant bronchitis, but is also to some extent to be regarded as compensatory.

The influence of hypertrophy is also shown by certain alterations in the vessels, especially in the arteries. Thus hypertrophy of the left ventricle of long standing may cause endarteritis of the aorta and its branches in consequence of the strain to which they are exposed

by the powerful stroke of the ventricle. A similar condition may also be observed in the pulmonary artery when it is subjected to very high pressure from hypertrophy of the right ventricle.

Symptoms and Course.—From the preceding remarks it will be evident that the symptoms of myocardial lesions must depend on derangement of the heart and peripheral circulation. The subjects of such disease may present some or all of the symptoms common to all severe cardiac disorders. Dyspnœa, palpitation, a sense of constriction, pressure, uneasiness or actual pain in the region of the heart are often complained of. At times such symptoms as headache, drowsiness, apathy, giddiness, flatulence, epigastric pain or weight after food, nausea, vomiting, constipation, diarrhœa and hæmorrhoids, depending on venous stasis of the cerebral or gastro-intestinal vessels, so engross the attention of the patient that he omits all mention of the more characteristic cardiac symptoms. Varying degrees of cyanosis and dropsy are seen in different cases. While it may be said that no single symptom is pathognomonic of disease of the heart, the association of dyspnœa and palpitation with signs of venous congestion and dropsy is very significant of the existence of cardiac failure, though no information is thereby afforded as to whether the disturbance of the circulation is primarily cardiac.

Dyspnœa.—Of all the symptoms just enumerated dyspnœa furnishes the most constant and important information as to the functional activity of the heart. Dyspnœa may be defined as increased action of the muscles of respiration, whether as regards frequency or degree of contraction. This symptom is described in somewhat different terms by patients. Some complain of a difficulty or tightness of breathing—that is to say, the act of respiration is laborious. Others say that they have no difficulty in the mechanical performance of respiration, but their utmost efforts fail to remove the distressing sensation of shortness or want of breath—the “air-hunger” of the Germans.

Dyspnœa may be either inspiratory or expiratory, according as it is mainly manifested by the muscles of inspiration or expiration; or it may be general—that is to say, both inspiratory and expiratory. Inspiratory dyspnœa is characteristic of obstruction of the larynx and trachea. The dyspnœa of bronchial asthma is typically expiratory. Cardiac

dyspnœa, on the other hand, is both inspiratory and expiratory.

The *pathology* of cardiac dyspnœa is less simple than it seems at first sight. An excess of carbonic acid or a deficiency of oxygen in the blood, the two being for the most part combined, provokes increased action of the respiratory muscles. This effect is partly the result of stimulation of the respiratory centre in the medulla oblongata by the altered blood, but another influence is probably also concerned. The asphyxial state of the blood at the same time excites the vaso-motor centre, the effect of which is seen in contraction of the small arteries throughout the body and in a rise of blood-pressure. Recent experiments have shown (v. Basch) that increased tension in the systemic arteries, in whatever manner it may be produced, is invariably followed by a rise of pressure not only in the left side of the heart, but also in the pulmonary circulation and right heart. The same author has shown that when the tension in the pulmonary vessels is raised the lungs swell up and become more rigid. In virtue of this change increased efforts on the part of the muscles of respiration are required to produce the requisite degree of expansion. This rigidity of the lungs is due to a sort of erection depending on distension of the capillaries, which unfolds the alveolar walls, and thereby enlarges the lumen of the air sacs. Basch believes that this condition, if long continued, may lead to vesicular emphysema.

Dyspnœa, or the increased activity of the respiratory muscles, is thus explained to be the result of vascular turgescence on the part of the lung. Cardiac dyspnœa had long been attributed by other authors to pulmonary congestion, but this was supposed to operate by impeding the entry of air into the alveoli, the consequent accumulation of carbonic acid in the blood being followed by stimulation of the respiratory centre. Basch, however, was the first to point out the mechanical effect upon the lung produced by engorgement of its vessels. This view is applicable not only to cases of high arterial tension, but also to the opposite condition, in which the blood-pressure is lowered as the result of weakness or insufficiency of the left ventricle, for in the latter event the dilatation of the ventricle allows the blood to collect in its cavity, and must have the effect of inducing a backward congestion of the pulmonary vessels and right heart. Pulmonary engorgement is

a result common to widely different affections of the heart, and may be regarded as the main element in the production of cardiac dyspnoea in virtue of a twofold action—(1) direct, on the lung, producing alveolar erection and rigidity; (2) indirect, on the respiratory centre, through the influence of asphyxial blood.

The dyspnoea of cardiac patients may be due to other causes also. Any diminution of the aërating surface of the lung by its interference with the diffusion of gases in the blood of the pulmonary capillaries will co-operate in producing dyspnoea, owing to the stimulating effect of the altered blood on the respiratory centre. Thus, pleural effusions compressing the lung, consolidation, collapse or œdema of the lung, bronchitis and emphysema are all in themselves efficient causes of dyspnoea, and may complicate any case of heart disease, but in such conditions the dyspnoea is no longer purely cardiac.

To return to the consideration of this symptom as it is presented to our notice by patients. In some cases, dyspnoea is objective—that is to say, we notice that the activity of respiration is increased, although the patient perhaps makes no complaint on this score. At other times shortness of breath is a prominent complaint, and here, as a rule, we find that dyspnoea is considerable. For patients do not commonly themselves complain of this symptom until dyspnoea becomes pronounced. It is important to determine whether dyspnoea occurs as the result of exertion, change of posture, excitement, indigestion of food or other definite external influences, or whether its development is apparently spontaneous. In the former case the development of dyspnoea on relatively slight provocation argues a certain degree of cardiac insufficiency which may not be incompatible with fair health, if the causes of dyspnoea can be avoided. On the other hand, spontaneous dyspnoea is a sign of more serious impairment of the heart's functional capacity.

Dyspnoea, though a most valuable symptom, cannot alone be trusted to give us reliable indication of failure of the heart. For muscular exertion may occasion dyspnoea and increased rapidity of the pulse in cases of cardiac enlargement where dilatation is satisfactorily compensated by hypertrophy. The development of dyspnoea on relatively slight provocation should, however, lead us to suspect that rupture of compensa-

tion has commenced. But the determination of the precise period at which failure commences is rarely possible, owing to the gradual manner in which the transition is effected. Signs of stasis in the lungs and portal system are among the earliest indications of insufficiency of the heart.

Orthopnoea is the condition in which the patient is compelled to sit upright, the reclining posture giving rise to severe dyspnoea. The relief obtained by this means is due probably to more than one cause. In the first place, in consequence of the erect position, the liver and abdominal viscera sink downwards, owing to the force of gravity, and the inspiratory descent of the diaphragm is thereby facilitated. Moreover, as Corvisart suggested, the vertical position impedes the flow of blood from the vena cava inferior into the heart, and reduces the engorgement of the right heart and pulmonary vessels. Again, when the patient sits up, the accessory muscles of respiration can act more freely, and are less hampered by friction, than when he lies on his back. Orthopnoea has the same significance as a high degree of dyspnoea. But, as Traube pointed out, orthopnoea is a more favourable symptom than the apathetic state in which some cardiac patients sink down in bed, for the former posture argues a degree of vigour which is wanting in the latter case.

Paroxysmal attacks of dyspnoea or cardiac asthma are comparatively uncommon, and are not specially characteristic of any particular form of heart disease. This condition is believed to depend on a sudden parietic relaxation of the left ventricle, but its pathology is still somewhat doubtful.

Palpitation is a subjective sensation and possesses much less diagnostic value than dyspnoea. When a patient is conscious of the heart's pulsation he is said to have palpitation. Many persons compare the sensation to the fluttering of a bird; others say that it is accompanied by a choking feeling in the throat. The sense of palpitation may be combined with violent action of the heart, that can be recognised by the physician, but at other times no external evidence of cardiac disturbance can be discovered. Moreover, the forcible pulsations of a greatly enlarged heart are often unassociated with any subjective sensations on the part of the patient. The pulse is usually, but not invariably, increased in frequency, and the rhythm of the heart's

action is generally to some extent deranged.

Palpitation is of common occurrence in all organic affections of the heart, especially when failure is threatened or actually established, but it is also a very common symptom in cases where there is every reason to believe that the heart is healthy. In either case the sensation is always more or less paroxysmal in character. Emotional, gastro-intestinal, uterine, and other impressions may cause palpitation in a reflex manner. Palpitation in organic affections is, generally speaking, a sign of cardiac debility, and in case of severe dilatation it may be an expression of disordered action of the cardiac ganglia, in consequence of the stretching to which the muscular parietes are subjected. A sense of palpitation is at times connected with attacks of extremely rapid action of the heart, the pulse rising as high as 200, an uncommon affection known as "tachycardia." No constant relation exists between palpitation and dyspnoea.

Pain.—Sudden paroxysmal attacks of agonising pain in the region of the heart, associated with a sense of impending death, and with other symptoms, may complicate various affections of the heart, and are further considered under the head of ANGINA PECTORIS (*q.v.*). Apart from anginal attacks, cardiac patients seldom suffer from severe pain, though a sense of oppression or pressure about the heart is very common. When præcordial pain is present it is apt to radiate to the arms, and especially to the left arm.

Rheumatic pains about the chest are sometimes incorrectly referred to the heart. In some cases there is marked tenderness on pressure or percussion, over the whole cardiac area, but localised painful spots may be sometimes discovered. Whether these tender points are really due to any lesion of the cardiac nerves is very doubtful. In some instances the pain and tenderness appears to be very superficial, and to depend on some affection of the intercostal nerves.

Pulse.—The pulse of dilatation and cardiac insufficiency is weak, small, frequent and generally of low tension, these characters being developed at an earlier date when the left ventricle is primarily affected. The presence of extensive arterial degeneration or chronic renal disease may modify the pulse of dilatation, a relatively high arterial tension persisting even when the cardiac debility is considerable. When dilata-

tion is more or less compensated by hypertrophy, the pulse may give no indication of disease.

The rapidity of the pulse, speaking generally, is increased in all cases of cardiac debility, though exceptions to this rule are not wanting. In the terminal stages a frequent pulse is almost invariable.

Cardiac Rhythm.—In most cases of cardiac insufficiency the heart and pulse exhibit some degree of irregularity in the force and volume of the individual beats, as well as in the intervals separating them. This condition has been described as *arrhythmia*.

Curious modifications of the heart's rhythm are sometimes noticed. In one form the beats run in pairs in regular succession, the second beat being usually weaker than the first, and being followed by a longer interval (*pulsus bigeminus*). In these cases the second weaker beat may fail to reach the wrist altogether, and what was at first regarded as a very infrequent pulse, proves, on auscultation of the heart to represent only half the number of contractions of the ventricle. At times a triple rhythm occurs where three beats follow each other at regular intervals, and are then succeeded by a pause (*pulsus trigeminus*). To these and other perversions of rhythm the term *allorhythmia* has been applied. *Allorhythmia* and *arrhythmia* have been ascribed with much probability to derangement of the intrinsic nerve apparatus of the heart, but the possibility of the nervous affection being central in some cases where no other evidence of cardiac disorder is present must not be lost sight of.

In most cases of insufficiency of the heart, the occurrence of *arrhythmia* or *allorhythmia* is of bad omen, and is significant of profound dilatation, with or without structural changes in the myocardium, the irregularity being due possibly to disordered action of the intra-cardiac nerve ganglia, consequent upon stretching of the muscular walls. This statement, however, must be made with considerable reservation, as cases of extreme cardiac failure may run a fatal course without any important alterations of the heart's rhythm, and, on the other hand, a considerable degree of *arrhythmia* or *allorhythmia* is not incompatible with complete integrity of the heart. The action of certain drugs, especially digitalis, must be mentioned as a relatively common cause of perverted cardiac rhythm.

Patients suffering from severe dilatation and insufficiency of the heart sooner or later present signs of **Venous Congestion and Dropsy**. The skin of the face and extremities becomes livid and cyanosed, the veins of the neck are distended and exhibit slight oscillations, or even systolic pulsation, in cases where tricuspid incompetence has developed.

The effects of venous stasis are felt at an early date by the lungs and abdominal viscera.

Lungs.—Passive congestion of the lungs, as we have already pointed out, is one of the first consequences of cardiac insufficiency, and is manifested by characteristic symptoms, of which dyspnoea is the chief. Accentuation of the second sound in the pulmonary artery is justly regarded as a valuable sign of high pressure in the vessels of the lungs, but it must be remembered that it also shows that the vigour of the right ventricle is not seriously impaired. For when failure of this chamber occurs, the accentuation of the second sound may disappear, although the pulmonary stasis is as great as ever. This possible source of fallacy should be borne in mind.

Congestion of the vessels is very apt to lead to serous transudation into the air sacs, which greatly aggravates the existing dyspnoea.

The pathology of *œdema of the lungs* is not altogether clear. Cohnheim believed that failure of the left ventricle with relatively unimpaired power of the right ventricle were the conditions necessary for its production. It is doubtful, however, whether this view expresses the whole truth. Slight degrees of pulmonary œdema may be quickly recovered from, but the presence of this complication is to be regarded as a grave symptom, partly as showing the existence of serious mechanical hindrance to the circulation, and partly on account of the restriction of the aerating surface of the lung which it involves.

Liver.—The low pressure at which the blood of the portal vein enters the liver explains the great tendency to passive congestion and enlargement displayed by this organ in response to any condition that impedes the entry of blood into the right auricle. When cardio-pulmonary stasis occurs the liver speedily becomes enlarged and tender, and, if there be leakage at the tricuspid orifice, expansile hepatic pulsation may be detected. Inasmuch as prolonged passive congestion is wont to cause induration and contraction, an enlarged

liver may gradually decrease in size, although the venous stasis persists, and the typical nutmeg change, or congestive atrophy of the liver, is then developed. This condition of the liver may be accompanied by a slight degree of jaundice, owing probably to passive duodenal catarrh. It is important to remember this fact, lest the gradual diminution of hepatic enlargement should give a wrong impression.

Spleen.—Enlargement of this organ can sometimes be recognised by palpation, but in the later stages the spleen is usually contracted.

Kidneys.—Congestion of the kidneys is shown by the excretion of scanty, high-coloured urine of high specific gravity, containing a small quantity of albumen, and often depositing copious urates on standing. A few hyaline casts may occasionally be detected on microscopical examination.

The symptoms of gastro-intestinal and cerebral congestion have been already incidentally referred to—constipation, diarrhoea, hæmorrhoids, vomiting, mental dulness and apathy.

Dropsy of the subcutaneous tissue, beginning in the lower extremities, but involving at an early date parts like the scrotum and eyelids where the skin is lax, is often followed, and is occasionally preceded, by transudation into serous cavities, such as the pleura or peritoneum. Dropsy of the pericardium is much less common, and is generally developed at a later stage.

The pathology of cardiac dropsy cannot be said to be satisfactorily explained by increased pressure in the veins alone, though this is undoubtedly an important factor. It is probable that a direct influence must be attributed to alterations in the chemical composition of the blood, dependent on the malnutrition of cardiac disease.

PHYSICAL EXAMINATION OF THE HEART.—The physical signs of dilatation and hypertrophy may be very pronounced, but from various causes this is by no means invariably the case. The most reliable information is derived from palpation and percussion.

When hypertrophy is well-marked, the præcordial region may show evident bulging, and the heart's pulsations may be unduly visible. Palpation shows that the impulse is forcible, heaving, and often diffused.

When dilatation preponderates over hypertrophy the impulse is weak, undulating, or impalpable. The præcordial

dulness is increased in cases of enlargement of the heart, whether this be due to hypertrophy or dilatation.

In the examination of the heart gentle percussion which determines the area of absolute cardiac dulness—i.e., the extent of the heart's surface uncovered by lung—gives better results than attempts to map out the actual size of the organ by forcible percussion. A careful cultivation of the sense of resistance, coupled with light percussion, is of the utmost importance in estimating slight degrees of cardiac enlargement. The elasticity of the sternum and its tendency to conduct vibrations to the neighbouring parts of the lungs, are so great that at times we may feel the pulsations of an hypertrophied right ventricle beneath this bone, and may yet be unable to detect any corresponding dulness on percussion. If, in such cases, Guttman's suggestion be adopted, and the left hand be firmly pressed on the upper part of the sternum, while percussion is made on the first finger placed over the lower end, we may sometimes succeed in damping the vibrations of the sternum, and in eliciting the dulness of the subjacent heart. Emphysema of the lungs and retraction of their anterior margins are also sources of error, and the presence of these conditions must be carefully taken into account.

In the presence of emphysema, extensive cardiac enlargement may be entirely masked by the resonance of the distended lungs overlapping the heart. Retraction of the edge of the lungs, more particularly the left, uncovering the heart, is very common in cases of chronic phthisis, and may simulate cardiac hypertrophy and dilatation, owing to the increased surface of the heart brought into contact with the chest wall.

The existence of auscultatory signs of phthisis in the corresponding lung with evidence of flattening and impaired movement of that side of the chest will generally prevent mistakes. At times the heart is evidently dislocated to one or other side, and no actual increase in the area of præcordial dulness exists. When, as sometimes happens, retraction of the lung occurs without falling in of the thoracic walls, difficulties are more likely to arise. In such cases the absence of the symptoms and consequences of cardiac disease will point to the conclusion that the enlargement of the heart is only apparent.

Auscultation usually gives little assistance in the diagnosis of hypertrophy and

dilatation, except in a negative way, though the absence of characteristic murmurs in a case of enlargement of the heart is of much importance, as tending to show that the efficiency of the valves is unaffected. It will be seen in the section on diseases of the valves that the complete absence of murmurs is not incompatible with the presence of a valvular lesion under certain circumstances, but speaking generally, the fact that no murmur is audible has the significance above stated. At times the ear may detect the impulse of a large, weak heart, which is scarcely to be recognised by palpation, and here auscultation (with a rigid stethoscope) possesses a direct value. The sounds of an hypertrophied heart are clear and distinctly audible, but the first sound is apt to be somewhat duller than usual.

When dilatation predominates, the first sound is shorter, sharper, and of higher pitch than in health, and resembles the normal second sound.

The second sound is not altered in either condition, except as the result of increased tension in the aorta or pulmonary artery.

Physical Signs of Enlargement of the Left Ventricle.—The apex beat is displaced downwards and to the left, and the cardiac dulness is increased in the same direction—that is to say, in its longitudinal or oblique axis. With hypertrophy the apex beat is strong and heaving, whereas the impulse of a dilated heart is weak and diffused, or may be quite imperceptible.

In hypertrophy of the left ventricle the heart sounds are louder at the apex than over the right ventricle.

Physical Signs of Enlargement of the Right Ventricle.—The apex beat is in the normal position, or slightly displaced outwards. The cardiac dulness is increased to the right, and not infrequently somewhat to the left also. Hypertrophy is shown by forcible pulsation over the lower end of the sternum and in the epigastrium, the heart sounds being louder over the right ventricle than at the apex.

We have seen that extreme dilatation of the ventricles may lead to incompetence of the auriculo-ventricular valves, hence a systolic murmur in the mitral or tricuspid area is not uncommonly developed in cases of severe dilatation.

If the patient should come under observation at this stage, it may be impossible at first to decide whether the valvular incompetence is absolute or

relative—that is to say, whether it is due to structural changes in the curtains, or to simple dilatation of the orifice. The course of the disease will often, but not always, solve the question. Great variations of intensity, or still more, a complete disappearance of the murmur as the heart's power is gradually restored, point to a relative incompetence of the valve.

The co-existence of a marked degree of enlargement with a weak, small pulse that cannot be accounted for by any valvular defect or other mechanical impediment is very significant of dilatation. Disappearance of the apex beat points in the same direction if the existence of emphysema and pericardial effusion can be excluded.

It may again be remarked that dilatation and hypertrophy are always associated in varying proportions, and that when we speak clinically of hypertrophy or dilatation being present, we mean that one of these conditions predominates.

The existence of enlargement of the heart without disturbance of the circulation argues hypertrophy; enlargement with evidence of circulatory derangement implies dilatation.

PERCY KIDD.

HEART, FATTY DISEASE OF.

—The clinical designation “fatty heart” includes two different forms of disease. In the first and most important variety a fatty degeneration or metamorphosis of the muscular fibres is the essential process. In the second, known as fatty infiltration, the quantity of sub-pericardial fat is increased in quantity. These conditions require separate consideration.

Fatty Degeneration of the Heart.—

Symptoms and Diagnosis.—The symptoms of fatty degeneration are very uncertain; indeed, this affection can only be suspected when it gives rise to dilatation and insufficiency of the heart; consequently dyspnoea, palpitation, a small irregular pulse, and other symptoms of dilatation are the indications to which we must look in the first instance.

It should be borne in mind that extensive fatty degeneration may exist without giving rise to any disturbance of the heart's functions, and that there is no essential relation between a fatty change and cardiac derangement. In the absence of signs of dilatation it is quite impossible to diagnose fatty degeneration of the heart. The presence of conditions that

are known to predispose to fatty degeneration may suggest the possibility of the lesion being present in a case characterised by dilatation and weak action of the heart, but it is seldom feasible to arrive at more than a probable diagnosis. A pulse falling to 50 or even lower, attacks of angina pectoris and cardiac asthma, Cheyne-Stokes' respiration, a tendency to syncope and sudden death, may be occasionally met with in cases of fatty degeneration of the heart, but these symptoms are not specially characteristic of this condition, and therefore possess only a relative value. The existence of arcus senilis is no longer believed to have any special relation to fatty changes in the heart.

Pathology of Fatty Degeneration.—It is customary to distinguish various forms of degeneration—parenchymatous, granular, and fatty—but it is probable that these are only different stages of one and the same process.

The morbid change in each instance consists in a transformation of the protoplasm of the muscular fibres, which lose their normal striation in varying degrees, the muscle fibres and nuclei becoming filled with albuminous and fatty granules.

Parenchymatous degeneration of the myocardium may exhibit all stages, from a mere reddish grey discoloration, or “cloudy swelling,” to an advanced condition of fatty degeneration, in which the substance of the heart is soft and yellowish, and exudes an oily fluid on pressure. In the common forms of fatty degeneration the deeper or sub-endocardial layers of the muscular tissue are marked with small yellowish patches and lines, the change being usually most pronounced in the case of the musculi papillares and trabeculae of the ventricles, though a similar condition may be widely diffused through the heart's substance.

In some cases it is thought that acute granulo-fatty changes in the muscular fibres are to be regarded as the results of inflammation, and the term “parenchymatous myocarditis” is then applicable. But, on the other hand, it is equally probable that an acute myocardial affection may be due to a parenchymatous degeneration. Acute myocarditis characterised by cellular infiltration of the intermuscular planes is of very rare occurrence.

Slight degrees of fatty degeneration are probably capable of complete removal, but our knowledge of the extent to which repair is possible in this and

allied conditions is mainly conjectural. Fatty degeneration occasionally leads to rupture of the heart and to fatal hemorrhage into the pericardium, the left ventricle being nearly always the seat of spontaneous rupture.

Etiology.—The cause of fatty degeneration is to be sought in a deficient supply of duly oxygenated blood to the muscular tissue of the heart. This may be the result of changes in the blood, as in anæmia (especially "pernicious" anæmia), phosphorus poisoning, specific fevers, the puerperal state, and long-continued pyrexia of any kind, or it may be due to any condition that interferes with the circulation through the coronary or nutrient arteries of the heart. Defective coronary circulation may be caused either by local obstruction or by failure of the heart's driving power. Thus, fatty degeneration may be the consequence of atheroma of the root of the aorta, involving the orifices of the coronary arteries, as well as of similar disease of these vessels themselves, or again it may be due to cardiac insufficiency resulting from any cause. Fatty degeneration may lead to dilatation, and therefore indirectly to hypertrophy, but more often cardiac enlargement is the primary condition, and granulo-fatty changes are only secondary effects. Fatty degeneration of the heart has no connection with general obesity.

Fatty Infiltration or deposit consists in an overgrowth of the sub-pericardial fat, which is normally most abundant along the auriculo-ventricular sulci, and in the course of the larger branches of the coronary arteries, over the right ventricle and at the apex of the heart.

Symptoms and Diagnosis of Fatty Infiltration.—The symptoms are practically the same as those of fatty degeneration, and depend upon the degree of dilatation and cardiac insufficiency present in individual cases. Attacks of angina and cardiac asthma may also occur in this form of fatty heart. It is doubtful how far dyspnoea is due to the condition of the heart in cases where little evidence of cardiac dilatation exists. It is probable that a tendency to shortness of breath is a direct consequence of obesity, extra work being thrown upon the heart by the great decrease of bodily weight. The occurrence of hypertrophy in fat persons may be thus explained in uncomplicated cases, but obesity is apt to be associated with other conditions which are known to cause hypertrophy, such as chronic renal

disease, arterio-sclerosis, or degenerative changes in the heart's muscle.

The *diagnosis* of this affection is even more uncertain than that of fatty degeneration. Fatty infiltration may be suspected in a fat person with a weak dilated heart. Physical examination is often greatly impeded in such cases, especially in women in whom the excessive development of the panniculus adiposus and of the mammary gland may render accurate percussion almost impossible. The position of the apex beat may assist in the determination of cardiac enlargement. In any case, however, diagnosis is merely a question of probability. Such cases occasionally terminate with the usual symptoms of dilatation and cardiac failure, or the patient may die suddenly from syncope.

Pathology.—In cases of fatty infiltration, the heart is buried in an envelope of fat, and the muscular substance seems to be thinned out and encroached upon by the adipose growth, which may extend deeply into the wall of the heart between the muscular fibres.

Microscopical examination reveals a fatty infiltration in the form of large oil globules separating the muscular fibres, these latter showing little or no qualitative change. The atrophy of the muscular wall has been attributed by some authors to the pressure of the fatty covering, but there can be little doubt that the muscular atrophy is not the result of the fatty growth. It is possible that the muscular change is the primary one, and is followed by an overgrowth of fat, just as in the case of the voluntary muscles in pseudo-hypertrophic muscular paralysis. On the other hand both changes may be the result of a common cause.

Etiology.—Fatty infiltration is commonly an expression of general obesity, but at times an accumulation of fat on the surface and in the substance of the heart occurs in wasting diseases like cancer and phthisis. Many fat people suffering from cardiac symptoms, and thought to be the subjects of "fatty heart," are found on post-mortem inspection to have greatly dilated and hypertrophied hearts without any excessive development of fat. It is not unusual to discover an excessive degree of fatty overgrowth on making a post-mortem examination in cases where no cardiac symptoms whatever were manifested during the patient's lifetime. It is a moot point whether plethora, resulting from excessive ingestion of food, is or is not to be credited with some

influence in the production of cardiac hypertrophy in cases of this description.

Prognosis.—The prognosis, whether in the case of fatty degeneration or fatty infiltration of the heart, turns on the pathology of the individual case. When the cause can be removed, as, for example, in some forms of anæmia and obesity, recovery is possible. When degenerative changes depend on local vascular causes we cannot expect repair, but when cardiac failure is the efficient cause of degeneration considerable relief may be obtained if the contractibility of the cardiac muscle can be restored.

Treatment.—The treatment of both forms of fatty heart, when they can be recognised, must be directed to improving the power of the heart and diminishing the dilatation of its cavities. In other words, the treatment is that of cardiac disease in general, and consists in the administration of digitalis, strophanthus, strychnine, ether, and other cardiac tonics, with a moderate amount of alcohol, rest, and a light nutritious diet. Direct treatment by means of drugs is only required when signs of cardiac failure are present. When these symptoms have disappeared or have been mitigated, we may endeavour to improve the nutrition of the cardiac muscle by cautious and gentle bodily exercise. Special attention must be paid to the regular evacuation of the bowels.

Where obesity exists, treatment must be judiciously directed to the reduction of this condition, and should include a regulation of the diet, gentle and regular exercise, and other suitable measures. In all cases of this description a rational general treatment is of the first importance. The patient should lead a quiet, regular life, and should be warned to avoid excitement and sudden exertion as far as possible. Moderation in the use of alcohol and tobacco must be particularly insisted upon. (*See EXERCISE*).

PERCY KIDD.

HEART, FIBROID DISEASES OF THE (including Cardiac Aneurysm, Chronic Myocarditis, Fibrous Transformation).—A fibrous change in the walls of the heart, either diffused or circumscribed, the latter variety often leading to the formation of a cardiac aneurysm.

Symptoms.—The symptoms of this affection are almost as uncertain as those of "fatty heart." It has been clearly demonstrated that a considerable degree of fibrous transformation of

the heart's muscle is not incompatible with perfect functional activity of the organ. But cases of serious dilatation and insufficiency have been recorded in which limited fibroid disease of the ventricle was the only morbid change discovered to account for the cardiac failure after death.

The positive symptoms of cirrhotic changes in the myocardium are those of cardiac affections in general—dyspnoea, palpitation, a sense of constriction, signs of passive congestion of the lungs, abdominal viscera and systemic veins, with or without dropsy. The immediate cause of these symptoms is to be found in dilatation and insufficiency of the heart. In addition to the above signs of disturbance of the circulation, common to all organic affections of the heart, there are certain symptoms that have been more particularly connected with fibroid disease. Attacks of cardiac asthma and of angina pectoris, a tendency to syncope, and a marked slowing of the pulse, which may fall to 30, or even lower, have been noted in some cases.

Marked irregularity of the force and rhythm of the pulse is not uncommonly present, especially where dilatation exists. Some German authors assign great diagnostic importance to this condition. Ruehle attributes the arrhythmia to the failure of the left ventricle, which is the chamber usually affected with fibroid disease. Riegel goes still farther, and maintains that arrhythmia may often be present before any symptom of insufficiency has arisen, and also that when dilatation and failure of the heart have yielded to treatment, arrhythmia may, nevertheless, persist as the sole cardiac symptom, and in such cases is almost a pathognomonic sign. This author explains the arrhythmia by the interference with the cardiac ganglia and nerves, caused by the fibrous disease in cases where the lesions are widely diffused. If this point should be established, it will constitute a valuable addition to our meagre stock of symptoms. It is doubtful whether Riegel's explanation would apply to cases where the morbid change is confined to the apex of the left ventricle, as is so often the case. Arrhythmia is a common symptom in cardiac dilatation from whatever cause, and when once this condition has developed, no special diagnostic value can be attached to the presence of arrhythmia.

Aneurysms of the heart frequently form as the result of circumscribed

fibroid disease, and may rupture into the pericardial cavity and cause sudden death; or they may open up communication between the various chambers of the heart, and occasion more or less disturbance of the circulation; but it is doubtful whether they are ever accompanied by any special symptoms that enable us to recognise their presence.

One of the most clearly established clinical characteristics of fibroid disease is the fact that death is very apt to occur in a sudden apoplectic form manner, and this not only in cases with actual cardiac symptoms, but in persons that were apparently in perfect health. This occurrence has never been satisfactorily accounted for.

It is not improbable that the sudden end of patients suffering from fibroid disease is due, in some cases at least, to an attack of angina pectoris. The frequency with which lesions of the coronary arteries are found in both affections lends some support to this view.

Quite recently the writer had the opportunity of observing such a case. A woman who presented signs of hypertrophy of the left ventricle, had suffered for some time from anginal attacks of moderate intensity. In one of these attacks she died suddenly. At the necropsy, fibroid disease of the apex of the left ventricle, atheroma of the coronary arteries, and cirrhosis of the kidney were found. The left ventricle was hypertrophied and dilated.

In exceptional cases sudden death has been the result either of rupture of the heart, an event especially likely to happen when cardiac aneurysm exists, or of embolism of one of the main coronary arteries, the latter condition being exactly analogous to ligature of one of the coronary arteries, which, as Cohnheim showed, speedily leads to permanent diastolic arrest of the heart's action. Cases of cardiac cirrhosis may terminate suddenly with embolism of the brain, or death may occur with the ordinary symptoms of cardiac failure, asthenia, venous stasis and dropsy.

Diagnosis.—It is very doubtful whether it is possible to distinguish this affection from other forms of myocardial disease. In a given case of dilatation and hypertrophy of the heart, associated with generalised atheroma of the arteries, the presence of fibroid disease may be suspected when extrinsic causes of cardiac enlargement can be excluded. Evidence of past syphilis would perhaps somewhat strengthen this suspicion. But when

efficient causes of hypertrophy and dilatation, such as lesions of the valves or renal disease co-exist, the diagnosis of fibrous changes in the heart is impossible.

When dilatation gives rise to relative incompetence of the auriculo-ventricular valves, with a systolic mitral, or tricuspid, murmur, the existence of fibroid disease may be easily overlooked, and the state of the heart may be attributed to a primary affection of the valves. The diagnosis of cardiac aneurysm can rarely be more than conjectural.

Pathology.—As already stated, fibroid disease of the heart may be either **diffused** or **circumscribed**. The former variety, described by Dr. Quain as connective tissue hypertrophy, occurs in dilated and hypertrophied hearts, the thickening being due to a diffuse overgrowth of the perimysium. Possibly this fibrous hyperplasia may be connected with congestion of the heart, to which Sir William Jenner called attention long ago. Great distension of the cavities of the heart must impede the return of blood by the coronary veins, and passive congestion of the viscera is known to lead to a certain degree of fibrous thickening. A diffuse intermuscular growth of connective tissue would have the effect of interfering with the heart's contraction, and would predispose to dilatation. Further investigation is required to clear up the pathology of this condition.

In the **circumscribed** form, patches of whitish, tough, fibrous tissue are found in the myocardium, especially at the apex, but they may be met with in other parts of the left ventricle. When the right ventricle is affected, the disease commonly appears to have spread from the left ventricle. These patches may involve the whole thickness of the cardiac wall, but not unfrequently they are most marked in the middle layers of the myocardium. Occasionally they are imbedded in the muscular tissue, and are only discovered on making sections of the heart's wall.

Fibrous thickening of the papillary muscles and endocardium is very common in all cases of high intra-cardiac pressure, but this condition must not be confounded with the present affection.

Microscopical examination shows that these patches consist of a dense fibrous tissue which, as a rule, is very poorly supplied with nuclei, though small areas of cellular infiltration may be seen in places, especially towards the margins.

Muscular fibres are generally absent altogether where the sclerotic process is most advanced, but a few isolated atrophic fibres, remains of blood pigment, or extravasated blood corpuscles, may be sometimes recognised among the scar-like tissue.

A varying degree of thickening of the perimysium is usually present at the margins of fibrous tracts, and may extend widely beyond the primary seat of disease. The intervening muscular tissue, as a rule, presents a healthy appearance, though some few fibres may exhibit granulo-fatty degeneration. Where the walls of the heart have undergone this transformation, they are usually somewhat thinned out, the fibrous parts being depressed below the level of the surrounding muscular tissue. The effects of this change on the functional activity of the heart vary considerably. When the cirrhosis is limited and of slight degree, it may give no evidence of its presence; but a more extensive transformation of the myocardium not unfrequently causes a marked degree of general dilatation and hypertrophy, the former as a rule predominating. The occurrence of general dilatation is to be explained partly by the extension of the cirrhotic change beyond the confines of the primary disease, and partly by the interference with the intrinsic nerve structures which the fibrous growth involves.

In certain cases the cirrhotic tissue gradually yields at some point to the internal pressure of the blood and a partial dilatation or **aneurysm of the heart** is produced. This represents the usual method of development of cardiac aneurysms.

Circumscribed thickening and adhesion of the pericardium are very commonly met with. The pericardial cavity may be entirely obliterated, but in general the adhesion and thickening attain their highest development over the fibroid area, and are usually confined to this point. Thrombosis is extremely common, and is usually limited to the portion of the ventricle corresponding to the myocardial disease.

The pathology of this disease has been the subject of much discussion. Fibrous induration of the myocardium may be a sequel of pericarditis or endocarditis, the inflammatory process being propagated directly to the muscular substance. In such cases which merit the term **chronic myocarditis**, the morbid process is always more or less limited to the

sub-pericardial or sub-endocardial layers, and does not give rise to the extensive cirrhotic changes that have just been described.

Until recent times the origin of **fibrous transformations** of the myocardium was generally attributed to a primary inflammation of the muscular tissue, and the disease was styled chronic interstitial myocarditis. It is now, however, generally recognized that this is not the usual course of events. The observations of Weigert and Huber have shown that in many, probably in most, cases fibroid induration or degeneration is closely associated with **obstruction of the coronary arteries**. The vascular obstruction may be partial or complete, and may involve one of the main coronary arteries or may be confined to one of their finer twigs. Moreover, owing to the great frequency with which atheroma attacks the root of the aorta, the orifices of the coronary arteries are very liable to become obstructed. Narrowing of these vessels, whether it be due to arteriosclerosis, endarteritis obliterans, thrombosis or embolism, causes anæmia and necrosis of the muscular bundles supplied by the corresponding arterial branch. When the occlusion is sudden and complete—an event more likely to occur in the case of embolism—infarction and coagulative necrosis of the myocardium may be followed by rapid softening and rupture of the heart's wall. In other instances a reactive hyperplasia of the connective tissue is produced. In the more ordinary form, where obstruction is gradual, atrophy of the muscular substance is also associated with fibrous changes. It is sometimes difficult to decide whether the connective tissue found in the cardiac wall is the result of a new formation or represents merely the normal interstitial framework stripped of the proper muscular elements; but the relative proportions of muscular atrophy and fibrous development are liable in all probability to considerable variations. In either case, however, the primary lesion is a vascular one, necrosis or atrophy being followed by a species of secondary scar-formation. This process is strictly analogous to the development of cicatrices in the kidney as the result of infarction.

Fibrous transformation, however, is not an invariable result of narrowing of the coronary arteries, for this condition may induce a fatty degeneration of the muscular tissue, and in some cases is

followed by no definite change whatever. These different results possibly depend on the degree of obstruction, as well as on the amount of collateral circulation that is developed. From Hyrtl's researches we know that the larger branches of the coronary arteries do not inosculate, but the result of injections carried out by Wickham Legg and S. West show that a considerable degree of anastomosis nevertheless exists; and this is probably effected by communications between the finer arterial branches. Complete occlusion of the coronary arteries, unless collateral circulation be speedily effected, leads to necrosis, with its results, softening or cicatrization. When obstruction is incomplete, the effects are more uncertain. Slight degrees of narrowing may have no injurious effects, whereas further restriction of the circulation may give rise to granulo-fatty degeneration, or to atrophy, necrosis and fibrous changes.

The predilection shown by fibrous transformation for the apex and neighbouring parts of the ventricles—*i.e.*, the distal points of the coronary circulation—the special liability to disease of the middle layers of the myocardium, the limited distribution of the change, and, lastly, the frequent association with disease of the coronary arteries, accord better with the theory of a vascular origin than with the hypothesis of a primary inflammation or chronic myocarditis. The fact that pericardial adhesions are so often strictly confined to the area of the fibroid patch is also opposed to the notion that the lesion is primarily pericardial.

The *etiology* of fibroid disease is consequently to a large extent the same as that of affections of the coronary arteries and of arterio-sclerosis in general.

Diffuse atheroma is known to be related to gout, syphilis, alcoholism, excessive muscular work and senile changes. The male sex is specially liable to arterial degeneration, and also to fibroid disease. Syphilitic gummata have occasionally been found in the heart's walls, and possibly some of the comparatively rare cases of chronic interstitial myocarditis may represent sequelæ of gummatous processes. Endarteritis obliterans of the coronary arteries has been ascribed to syphilis.

Treatment.—The treatment is that of cardiac disease in general, and the remarks made in the article on **FATTY DEGENERATION OF THE HEART** (*q.v.*) are applicable here also. When insuffi-

ciency of the heart is pronounced, digitalis should be given cautiously; but the effect of this drug must be carefully watched, as it sometimes increases the irregularity and weakness of the pulse.

When the pulse is very infrequent, digitalis is contra-indicated. Other cardiac stimulants, such as ether, ammonia, strychnine, alcohol, are sometimes of more service than digitalis, and may be more freely and safely administered. A course of iodide of potassium should be tried if the patient has suffered from syphilis.

Anginal attacks must be treated on the general principles described in the article on **ANGINA PECTORIS** (*q.v.*).

Cardiac asthma is often benefited by stimulant remedies like ether and ammonia, but at times injections of morphine alone give relief.

PERCY KIDD.

HEART, HYPERTROPHY AND DILATATION OF THE, FROM OVERSTRAIN.

—The influence of excessive bodily exercise on the heart is discussed in a general manner in the article on **DISEASES OF THE MUSCULAR WALLS OF THE HEART** (*q.v.*), but the importance of this relation is so great that the subject requires separate consideration.

It has long been known that the hearts of stags that have been hunted are often found to be enormously hypertrophied, and similar observations have been made in the case of race-horses. The comparatively recent researches of Da Costa, Myers, and other authors have clearly shown that the human heart is also liable to hypertrophy and dilatation under analogous conditions.

Instances of marked insufficiency of the heart, presenting the usual signs of hypertrophy and dilatation, are not unfrequently met with in which none of the ordinary causes of cardiac enlargement can be discovered. That is to say, the most careful investigation, both clinical and anatomical, shows a complete absence of disease of the muscular walls or valves of the heart, of arterial degeneration, renal disease, and emphysema or other chronic affection of the lungs. In many cases a review of the conditions under which the patients have lived establishes the fact that their occupation involved prolonged and heavy muscular work.

The *symptoms* of overstrain do not differ from those of dilatation and hypertrophy resulting from other causes. All

degrees of insufficiency or failure of the heart may be observed in different cases.

The *course* of the disease may be progressive, terminating gradually with signs of venous stasis, dropsy and exhaustion; or death may occur more suddenly as the result of embolism or other accidental complications. In other instances temporary improvement may ensue, and complete recovery is not impossible if the affection be recognized at an early stage.

The *diagnosis* turns partly on the presence of dilatation and hypertrophy, without any evidence of valvular lesion or other recognized causes of cardiac enlargement, and partly on the laborious nature of the patient's occupation. As a rule, the exclusion of some degree of renal or myocardial disease is extremely difficult, and often impossible, and when, as sometimes happens, more than one of these conditions is present, the diagnosis is very uncertain. Enlargement of the heart occurring in a young man engaged in very heavy work may, with a considerable degree of probability, be ascribed to overstrain when no other condition favouring hypertrophy and dilatation can be recognized.

Pathology.—The cardiac enlargement is commonly most pronounced in the case of the left ventricle, but some degree of general hypertrophy and dilatation is almost always present. This fact strongly supports the connection between bodily labour and enlargement of the heart, for, as stated in the article on the DISEASES OF THE MUSCULAR WALLS OF THE HEART (*q.v.*), the effects of muscular exercise are primarily exerted on the left ventricle.

It is probable that the initial change is a yielding of the left ventricle to the increased arterial pressure, dilatation being rapidly followed by an amount of hypertrophy that is liable to considerable variation. When prolonged and excessive demands are made on the activity of the heart, the development of a moderate degree of hypertrophy must be beneficial, as tending to counteract the effects of dilatation. But in the cases now under consideration, the hypertrophy which results is insufficient for this purpose, and it would seem that such hearts were not originally possessed of the average power of resistance or reserve force.

Ætiology.—An adequate supply of healthy blood to the cardiac muscle is a condition necessary for the development of hypertrophy, and Dr. Allbutt has par-

ticularly emphasized this point by insisting upon the influence of bad feeding in the causation of overstrain of the heart. This affection, as he shows, has been comparatively rarely met with among the wealthier classes, most of the cases having occurred among blacksmiths, porters, and workers at various trades, in whom the effects of heavy manual work and insufficient food are more apt to be combined. Cardiac overstrain is very seldom met with in the female sex. Da Costa, in his observations on soldiers, found that this condition of dilatation and hypertrophy was preceded in several instances by symptoms of what he calls "irritable heart," a subject which is more fully considered in the article on NEUROSES OF THE HEART (*q.v.*).

Treatment.—Rest is indispensable, and is of more value than any other measure. The patient's occupation must be modified or changed so as to allow, as far as possible, of the removal of the cause of the disease. Digitalis should be exhibited only when signs of cardiac failure are manifested, and its effects must be carefully watched. If irregularity of the heart's action appear, or become aggravated, the drug must be discontinued. Ether, ammonia, strychnine, and other cardiac tonics may be used under the same circumstances, and may at times be advantageously combined with digitalis. Da Costa recommends aconite when hypertrophy is commencing. It is open to doubt, however, whether hypertrophy *per se* requires any special treatment beyond rest. The diet should be moderate, but nutritious, and alcohol in small quantities may be allowed. The importance of a regular action of the bowels cannot be too much insisted on.

The treatment of special symptoms must be conducted on appropriate general principles. PERCY KIDD.

HEART, NEUROSES OF THE.

—This class includes all those cases in which symptoms of cardiac derangement occur without physical signs of organic disease. Neurotic influences may, and no doubt do, play an important part in structural disease of the heart, but we are now only concerned with uncomplicated neuroses.

The *symptoms* of cardiac neurosis are mainly palpitation, arrhythmia, and alterations in the frequency of the heart's action. It is characteristic of neurotic affections of the heart that they are always more or less paroxysmal in

character. For purposes of convenience the symptoms will be considered separately, but, as a matter of fact, they are commonly combined in varying proportions, one or other symptom predominating.

Palpitation.—Palpitation may be a purely subjective sensation, though it is usually associated with over-action of the heart and signs of vascular excitement.

Some degree of præcordial discomfort or even pain is at times connected with this symptom.

Palpitation may be due to increased reflex excitability of the heart, or to abnormal sensitiveness on the part of the patient to the pulsation of the organ. In the first case, palpitation is the result of impressions transmitted from the digestive, sexual, or respiratory organs, or it may be due to emotional or mental disturbance of various kinds. Flatulent distension and simple dyspepsia are perhaps the commonest causes of reflex palpitation; but, at the same time, it is important to recognize the fact that gastro-intestinal derangement and palpitation may both be the consequence of some disorder of the nervous system. Sexual excesses and masturbation are also frequently concerned in the production of nervous palpitation.

The same symptom again may be induced by such trifling causes as lying on the left side, slight exertion, or the mere entrance of food into the stomach; and palpitation is not uncommonly directly traceable to the influence of tobacco, tea, coffee or alcohol.

When the sense of palpitation is unassociated with any marked objective signs of cardiac derangement, it will often be found that the patients are the subjects of functional nervous affections, such as neurasthenia and hysteria.

Nervous palpitation in some cases is relieved by physical exertion—a point which distinguishes it from the palpitation of organic disease.

Balfour suggests that the relief thus obtained is to be explained by the flushing of the heart's substance with blood as the result of quickened coronary circulation. Persons suffering from anæmia and debility of various kinds are very liable to palpitation, and a similar tendency is at times observed in plethoric conditions. Nervous palpitation is not confined to either sex, though it is undoubtedly more often met with in women than men (*see also* DISEASES OF THE MUSCULAR WALLS OF THE HEART).

Arrhythmia.—All degrees of arrhythmia may occur, including simple intermission, where one or more beats of the heart are dropped at intervals without further disturbance of rhythm, inequality of volume of the individual beats, or a combination of these two conditions, and allorhythmia. In some cases the patient may be unconscious of any cardiac derangement, or, as Balfour says, "an intermission is followed by a thump"—i.e., by a forcible contraction of the ventricle which attracts attention. Some persons are very sensitive to the least cardiac irregularity, and take notice of a simple intermission even when it is not succeeded by a thump. Irregularity of volume is, generally speaking, of more significance than simple intermission, and should always suggest the necessity of repeated examination of the heart under different conditions; but cases are met with in which both forms of arrhythmia are habitually present without any ill-effects, and even without the knowledge of the patient. Arrhythmia, like palpitation, may be a reflex symptom of gastro-intestinal, sexual or emotional origin, and is a common result of the abuse of tea, coffee, tobacco or alcohol. Gout is also believed to be a frequent cause of this condition.

Alterations in the Frequency of the Heart's Action.—The frequency of the heart's action is more often increased than diminished, but changes may occur in either direction as the result of similar causes to those that have been already enumerated. A frequent pulse is often, but not necessarily, associated with a feeling of palpitation.

Tachycardia, a condition characterized by paroxysms of extremely rapid cardiac action, has been referred to under the head of *Palpitation*. This comparatively rare affection, which represents a true neurosis of the heart, may be the result of a transient paralysis of the vagus or of irritation of the accelerator nerves of the heart, and has been attributed to errors in diet, the action of tobacco, alcohol, &c. A similar condition has been observed by Wilks in combination with severe dyspnoea and palpitation in cases of nephritis, mostly of scarlatinal origin, but speedy recovery ensued in nearly every instance.

Uterine displacements and pregnancy have been said to produce a condition of tachycardia in a few instances. Lesions of the cardiac plexus, vagus nerve and medulla oblongata have occasionally

been found in cases where the pulse had been very rapid during life.

A very **infrequent action** of the heart, falling as low as thirty beats in the minute, is sometimes the only sign of any cardiac disorder. In cases of this description the pulse should always be controlled by auscultation of the heart, as some of the beats may fail to reach the periphery in certain degrees of arrhythmia or allorhythmia, and a wrong conclusion may be arrived at concerning the frequency of the heart's contractions. Apoplectiform attacks are occasionally associated with infrequent action of the heart, and are possibly due to cerebral anæmia.

Extreme retardation of the pulse, or the opposite condition of increased frequency, and arrhythmia are sometimes produced by diphtheria, probably from some lesion of the cardiac nerves. Changes in the frequency of the pulse have also been observed in cases of tabes dorsalis.

The term **Irritable Heart** was given by Da Costa to a class of cases occurring among soldiers in which the leading features were palpitation, cardiac pain, dyspnoea on exertion, irregularity of the heart, and a remarkable tendency to increased frequency of the pulse on slight provocation. In these cases a change from the reclining to the upright position alone sufficed to raise the pulse rate to the extent of thirty or forty beats per minute.

This group of symptoms was directly traced in many instances to hard muscular exercise, such as forced marches. In other cases an attack of diarrhoea or fever seemed to be the starting-point of the disorder, the symptoms developing as soon as the soldier returned to his active life.

In the great majority of Da Costa's patients no sign of organic disease existed, but in a small percentage a condition of hypertrophy supervened.

Cases such as these furnish a connecting link between the two groups of functional and organic disease of the heart, and are in all probability connected with cardiac overstrain. A similar train of symptoms occasionally develops as a sequel of acute rheumatism, and is not uncommonly observed in neurotic or delicate persons of both sexes in whom the heart is constitutionally weak.

It may again be stated that one or all of the symptoms that have been considered in detail may be present in a given case.

Angina pectoris is regarded as a neurosis of the heart by some writers, but this topic is treated elsewhere.

Diagnosis.—The diagnosis depends on the presence of characteristic cardiac symptoms without signs of structural disease. The heart sounds are clear, and the first sound is apt to be short and sharp, resembling the normal second sound. Accidental murmurs are occasionally heard, especially when the heart's action is excited, and are almost invariably systolic. Such murmurs may be of cardio-pulmonary origin, or they may be the result of anæmia or relative incompetence of the auriculo-ventricular valves. In all such instances, and where anæmia or persistent arrhythmia exists, careful and repeated examination of the patient in the reclining as well as in the upright position is necessary to enable us to exclude the presence of organic disease. In some cases of anæmia the diagnosis presents great difficulties. Where the frequency of the heart's action is persistently increased, the question of Graves' disease must be taken into consideration, as the development of proptosis and goitre may be preceded for some time by signs of cardiac excitement.

In most cases the neurotic constitution of the patient, the exaggeration of the cardiac symptoms as compared with the physical signs, and the paroxysmal and capricious character of the attacks will point to a correct conclusion.

Prognosis.—The prognosis is favourable as regards the duration of life, but the chances of recovery or improvement depend largely on the nature of the neurosis in individual cases. Where the origin of this affection is most obscure, as in habitual arrhythmia, the prospects of improvement are not very hopeful.

Pathology.—In attempting to account for the occurrence of cardiac neuroses it is necessary to distinguish as far as possible those that are reflex from those that are direct.

The derangement of the nervous mechanism of the heart may be the result of some cause acting on the vagus or accelerator nerves, or on corresponding nerve cells in the medulla oblongata, or in the heart itself. A preponderance of the inhibitory or accelerating centres, or paresis of one or other centre, would account for changes in the rhythm and frequency of the heart's beats, but we know little of the exact mutual relations of these antagonistic influences in the human heart. The intrinsic cardiac

ganglia are believed to be concerned in the co-ordination of the heart's muscular contractions, and it is reasonable to suppose that lesions of these structures may give rise to arrhythmia.

The subjective sensation of palpitation must be conveyed by afferent fibres of the vagus and sympathetic nerves, but the conditions of the heart that originate this sensation are unknown.

It is still a matter of dispute whether neuroses of the heart can lead to organic lesions. This sequence of events may undoubtedly occur in Graves' disease, which is to some extent a cardiac neurosis, but with this exception such a transition is altogether exceptional. It has been suggested that one reason for this difference is to be found in the fact that in the ordinary forms of cardiac neuroses the functional disturbance is essentially paroxysmal, the heart having time to recover in the intervals separating the individual attacks; whereas in Graves' disease the over-action of the heart is continuous, and is therefore more liable to lead to debility and dilatation. In Da Costa's cases of "irritable heart" in which hypertrophy developed, it must be remembered that both conditions were directly connected with muscular exertion, and the irritable stage may have been an indication of commencing dilatation which was followed by compensatory hypertrophy. Sudden death is said to have occurred in cases of neurotic affections of the heart in consequence of fatal inhibition of the organ from shock. It is, however, doubtful whether the heart was altogether free from structural disease in these cases.

Treatment.—In the treatment of cardiac neuroses the general condition and constitution of the patient require careful consideration. Undue emotional excitement, mental overwork, worry or anxiety must be obviated as far as circumstances admit. Moral treatment is of great importance. The patient must be encouraged to believe that the heart is not actually diseased, and too much attention should not be directed to this organ by the physician. Anæmia, debility, neurasthenia, hysteria or gout must be met by appropriate methods of treatment. In such cases a judicious exhibition of iron, strychnine, arsenic, quinine, valerian, iodide of potassium, will often give good results. Plethoric conditions may be relieved by moderate saline purging.

If we have to do with nervous irritability, whether general or cardiac,

bromide of ammonium and the application of a belladonna plaster to the præcordia may be of much service.

When irregularity of the heart's action is a permanent feature, the internal administration of belladonna or atropine may be prescribed. In all cases of reflex origin the cause should, if possible, be removed, but it must be admitted that the determination of the cause is not always an easy matter. The relief of dyspepsia and of morbid conditions of the uterus is sometimes effectual in removing the symptoms of cardiac derangement. The investigation of the question of sexual excesses is a matter requiring great delicacy and tact, but in the case of young men suffering from neurotic disturbance of the heart, which is not explicable on other grounds, this possibility should always be kept in mind and judicious inquiries should be instituted. Patients must be cautioned against the excessive use of tobacco, tea, coffee and alcohol.

Cases of habitual arrhythmia, or where the pulse is very infrequent, often resist all treatment, but fortunately the general health may be in no way affected.

There is much difference of opinion as to the efficacy of digitalis. In uncomplicated neuroses of the heart digitalis is not generally of much use, but in cases of "irritable heart" depending on overstrain, or when the cardiac action is very feeble and rapid, this drug may be prescribed with great advantage. For the relief of the paroxysm, rest, the administration of ammonia, ether or brandy, smelling salts, and the application of an ice-bag to the præcordial region are to be recommended, and in exceptionally severe cases a hypodermic injection of morphia may be resorted to when other measures fail.

PERCY KIDD.

HEART, ACUTE DISEASE OF THE VALVES (Acute Endocarditis).—Inflammation of the endocardium may be either *acute* or *chronic*, the latter being often the sequel of the former. In the great majority of cases the affection of the endocardium is limited to the valves of the heart or occurs in their immediate neighbourhood.

Acute endocarditis may be divided, for practical purposes, into two main groups, *simple* and *malignant*. Although at times it is difficult, or even impossible, to distinguish the two varieties clinically, it will be convenient to discuss them separately as regards their symptoms and

course. The diagnosis is further complicated by the fact that transitional forms are not uncommon, and cases of simple endocarditis may subsequently assume a malignant type.

Simple Endocarditis.—*Symptoms and Course.*—Acute endocarditis in its early stages gives rise to no characteristic cardiac symptoms. The fever which is always present in some degree is to be attributed mainly, if not solely, to the rheumatic or other process on which the endocarditis has supervened. At the same time there is no doubt that endocarditis is in itself an efficient cause of pyrexia, and in certain circumstances exacerbations of fever may, with some probability, be attributed to the endocardial inflammation—*e.g.*, when the rise of temperature coincides with an aggravation of general symptoms that cannot be accounted for by a fresh outburst of rheumatism.

Such symptoms as a rapid pulse and excited action of the heart have been ascribed to endocarditis, but it is more probable that they are simply the effects of pyrexia. Physical examination of the heart is the only means that enables us to detect the presence of endocarditis. The appearance of a systolic murmur, or a prolonged first sound at the apex, is commonly the earliest and only indication that the endocardium is affected, the mitral valve being more prone to the disease than the aortic. Diastolic and præsystolic murmurs may occasionally be detected, and are certain signs of valvular disease; but they are much less common than systolic murmurs in the early stages. It is at times impossible to say whether a systolic murmur is due to structural changes in the valves, to relative incompetence, or to anæmia.

Enlargement of the heart as a consequence of valvular defects requires time for its development, and is rarely met with at this period. Acute dilatation may, however, ensue at a comparatively early date as a result of inflammatory or other affections of the myocardium. When the endocardial lesions are progressive, the functions of the valves sooner or later become impaired, and mechanical disturbance of the intra-cardiac circulation is necessarily followed by some degree of dilatation of the various chambers. The lesions of the valves and their effects are considered under the head of CHRONIC ENDOCARDITIS (*q.v.*). Pericarditis or myocarditis may arise as complications, or they may occasionally precede endocarditis. In other cases

they seem to develop simultaneously. Embolic manifestations are rare accidents of the initial stages of simple endocarditis. Repair is possible when the process has not advanced too far; but in the majority of cases the acute stage is succeeded by contractile fibrous changes, and the patient is left with the signs of chronic valvular disease.

Malignant endocarditis is also known as *ulcerative, diphtheritic, infectious, and septic endocarditis*, but the term "malignant" is adopted provisionally as the least objectionable, a clinical classification only being feasible in the present state of our knowledge.

Symptoms and Course.—The onset of malignant endocarditis may be marked by rigors, headache, vomiting, a sudden rise of temperature and other signs of acute constitutional disturbance, or, occasionally, the disease may develop insidiously. In either case the condition of the heart is apt to be overshadowed by the general symptoms, and except in cases where endocarditis supervenes on old valvular disease or appears in the course of rheumatic fever, where the heart is, as a matter of routine, examined frequently, the affection may escape notice.

Profound prostration is always an early and important symptom. Fever is usually high, and may present an irregular, remittent or even intermittent type, comparable to that of ague. Very severe cases, on the other hand, may sometimes be attended with a comparatively slight elevation of temperature.

Cardiac symptoms are usually late in appearing; but dyspnoea, palpitation, pain and marked physical signs of valvular disease may occasionally develop with great rapidity. The information derived from physical examination, however, is apt to be very equivocal, especially in the case of faint systolic murmurs. When a murmur suddenly appears, or alters in character under observation in a febrile case of doubtful nature, the possibility of ulcerative rupture or laceration of valves should always be carefully considered.

The occurrence of such symptoms as coma, delirium, convulsions, hemiplegia, pain in the region of the spleen, hæmaturia, purpuric skin eruptions, and retinal hæmorrhages, pointing to multiple embolic infarctions, would furnish very strong evidence in favour of the existence of malignant endocarditis. The development of abscesses in different parts of the body, either with or without hæmorrhages, would point in the same direction.

Enlargement of the spleen is almost a constant feature, independently of embolism; and profuse sweats are very frequent. Diarrhœa, meteorism, slight jaundice, albuminuria, pneumonia and pleurisy are also not uncommon complications. Secondary inflammation of the joints is said to occur in some cases without suppuration.

Malignant endocarditis commonly manifests a more or less typhoid or else a pyæmic character.

The resemblance to typhoid fever is sometimes very close, the state of the abdomen, marked with a suspicious skin eruption, the gastro-intestinal symptoms, enlargement of the spleen, the characteristic temperature chart and the general condition all combining to mislead. The pyæmic type, with its repeated rigors, perspirations, hectic irregular temperature and slight icterus, is less common than the preceding. Most cases fall into one of these two categories, though pyæmic and typhoid features are very apt to be associated in varying degrees, and no strict classification is possible. A further division of cases into cerebral, cardiac and other groups, according to the predominant symptoms, serves no practical purpose. Fallacies inevitably arise in attempting to decide whether recovery is possible, owing to the difficulty of distinguishing milder forms of the malignant affection from severe cases of simple endocarditis. A fatal issue ensues in all, or nearly all, well-marked examples of the disease, and is not unfrequently preceded by coma or other cerebral symptoms. Life is rarely prolonged beyond a few weeks, and cases have been known to terminate within a few days.

Diagnosis.—The diagnosis of endocarditis must be based on the results of physical examination of the heart. The malignant form is distinguished mainly by the gravity of the general condition, and by the presence of typhoid or pyæmic symptoms. The generally higher range of temperature, and the marked tendency to splenic enlargement and multiple embolism, are also important characteristics of this variety. The diagnosis of malignant endocarditis from typhoid fever, pyæmia, meningitis and acute disseminated tuberculosis may at times be extremely difficult; but the condition of the heart, the occurrence of cutaneous and other hæmorrhages and the development of acute nephritis are the chief points that would serve to indicate endocarditis. The course of the fever and ætiological considerations may in a minor

degree assist us in arriving at a correct diagnosis.

Prognosis.—In simple endocarditis the prognosis is favourable as regards the immediate present, but the great probability of chronic valvular disease becoming established makes the patient's future very uncertain. In the case of the malignant form the prospect is all but hopeless.

Pathology.—Any part of the endocardium may be invaded, but the valves are nearly always the parts affected, owing to the greater strain to which they are subjected. In adult life endocarditis is almost confined to the left side of the heart, in consequence of the greater variations of pressure to which this side is exposed; whereas, in the fœtus, the right heart, for similar reasons, is alone affected. Affections of the right heart in adults are nearly always secondary to similar disease of the left side. The mitral valve is rather more liable to become affected than the aortic.

The presence of endocarditis in the early stages is shown by the appearance of small transparent nodular projections of the endocardium, which subsequently become invested with a varying degree of fibrinous deposit from the blood. The development of these granulations, or *vegetations*, as they are called, is the result of a small-celled infiltration in the sub-endothelial connective tissue of the valves, which gives rise to small elevations of the endothelial membrane. The inflamed condition of the endocardium occasions a localized thrombosis, in consequence of which the granulations increase in size, and acquire a greyish colour and a more or less granular or uneven surface. In some instances the cellular growth shows a marked disposition to necrosis or ulceration, so that the main change appears to consist in a loss of substance. In malignant or ulcerative endocarditis various kinds of micrococci are always found in the floor of the ulcers, extending to a varying distance into the subjacent tissues. Micro-organisms may also be frequently detected in the superficial fibrinous layers of the vegetations, sometimes in masses. Cases in which they are found in large numbers generally present affinities with the ulcerative form, and belong to the malignant type of endocarditis. Vegetations may vary in size from a pin's head to a bean or a small cherry, the largest growths being generally composed of aggregations of smaller ones. In most cases they are sessile, but they may be

pedunculated, and swing freely to and fro in the blood.

The lesions, whether warty or ulcerative, may be developed on healthy valves or on valves that are the seat of old disease, evidence of old valvular lesions being often found post-mortem in cases of the malignant type, and in those apparently acute in character.

Cases of simple chronic endocarditis may acquire a malignant type independently of the co-existence of any febrile disease, the injured valves apparently affording a favourable nidus for the development of the pathogenic microbes.

The seat of valvular vegetations is determined by the lines of contact of the individual segments of the valve, or rather by the point of maximum pressure. This corresponds, not with the edge, but with a line more or less parallel to, but slightly removed from, the free margin. The auricular surface of the mitral and tricuspid, and the ventricular aspect of the semilunar valves, are the parts that are mainly or exclusively affected. The chordæ tendineæ of the mitral valve, and the posterior wall of the left auricle, are also not unfrequently studded with granulations, those on the latter site often marking the course of the regurgitant stream. In the early stages of their development, the vegetations may be completely absorbed, without any permanent alteration of the valve taking place, or they may gradually disappear, and be transformed by a process of cicatrization into dense fibrous tissue. The results of this process are considered under the head of HEART, CHRONIC DISEASE OF THE VALVES (*q.v.*).

The vegetations may themselves also undergo ulcerative changes, leading to perforation or aneurysm of the valves, or in certain cases to acute aneurysm of the substance of the heart, or of the root of the aorta. Similar accidents may arise in the course of the typically ulcerative form. Rupture of the chordæ tendineæ, or of the curtains, may also occur, and give rise to various valvular defects. Ulceration is often mechanically excited by the friction of pendulous vegetations against neighbouring parts, and in some cases partial aneurysm of the heart's wall is thus produced. The size and position of the vegetations may prevent the adequate closure of the valves, and at times may cause obstruction of the orifices.

Detachment of fragments of the granulations, or of portions of the valves, is not uncommon, and gives rise to embolism and hæmorrhagic infarction in the brain,

spleen, kidney, myocardium, retina, or other parts. Pyæmic abscesses, and purulent meningitis, may also develop in the same manner in malignant forms of endocarditis, from the entrance into the blood of pathogenic microbes derived from the diseased endocardium. Multiple hæmorrhages may occur in both forms of endocarditis, but they are far less common in the simple variety. In some cases, especially of the severe type, embolism is succeeded by inflammatory softening of the coats of the arteries of the brain, mesentery, or extremities, leading to the production of embolic aneurysms.

Endocarditis is sometimes regarded as a primary affection; but in such cases, a careful inquiry will not unfrequently discover evidence of previous ill-defined rheumatic manifestations, chorea, nephritis, or some of the less common antecedents of the disease.

Ætiology.—Simple endocarditis, in the great majority of cases, is the result of rheumatic fever, and only occasionally occurs in connection with other specific diseases, such as scarlatina, diphtheria, measles, typhoid fever, puerperal fever and other septic conditions, pneumonia, gonorrhœa, and syphilis.

Malignant endocarditis may arise in connection with acute rheumatism, scarlatina, diphtheria, pneumonia, and other specific fevers; but more frequently, no such relation can be established. Rheumatic endocarditis is more common in women than in men, and shows a special tendency to attack young persons.

Nephritis and chorea are not uncommon antecedents of endocarditis, and certain ulcerative diseases, more particularly phthisis pulmonalis, seem to be associated with the development of similar lesions of the valves.

Treatment.—The treatment of simple endocarditis practically merges in that of acute rheumatism; but, unfortunately, remedies like the salicylates, which have such a beneficial action on the rheumatic process, seem to have no effect in preventing the development of endocardial complications. The value of complete and prolonged rest in bed, on the other hand, is unquestionable. In cases of malignant endocarditis, we can only adopt measures suitable for other septic conditions—a nutritious diet and stimulants being of the most importance. Drugs like quinine, arsenic and sulphocarbolate of sodium have been tried without much result. Cardiac symptoms depending on the secondary effects of

valvular lesions must be dealt with on the principles set forth in the following article.

PERCY KIDD.

HEART, CHRONIC DISEASE OF THE VALVES (Chronic Endocarditis).—The subject of chronic valvular disease does not readily lend itself to the method of arrangement adopted throughout this work, and in this article a discussion of the general pathology of chronic endocarditis precedes the description of the lesions of the valves, which are treated in the following order:—

- I. Aortic Incompetence.
- II. Aortic Stenosis.
- III. Mitral Incompetence.
- IV. Mitral Stenosis.
- V. Pulmonary Incompetence.
- VI. Pulmonary Stenosis.
- VII. Tricuspid Incompetence.
- VIII. Tricuspid Stenosis.
- IX. Combined Valvular Disease.

Each of these subjects is discussed under the following headings:—

- a. *Pathology.*
- b. *Effects upon the Heart and Circulation.*
- c. *Symptoms and Course.*
- d. *Complications.*
- e. *Physical Examination of the Heart.*
- f. *Pulse.*
- g. *Diagnosis.*

Finally, the PROGNOSIS and TREATMENT of valvular disease is discussed.

General Pathology of Chronic Endocarditis.—This condition consists in a fibrous or cirrhotic thickening of the valves which is commonly associated with contraction, and in many cases with calcification. The diffuse thickening of the endocardium resulting from increased intra-cardiac pressure frequently seen in cases of dilatation and hypertrophy has no clinical significance, and need not now be considered.

A fibrous change in the valves is a sequel of acute rheumatic endocarditis in a large number of instances, but similar lesions may develop insidiously as the results of chronic renal disease, arterio-sclerosis, gout, chronic alcoholism, cardiac overstrain, senile degeneration and syphilis.

In many, perhaps in all, of these conditions the valvular thickening is an effect of increased blood pressure. The close relationship of gout to cirrhosis of the kidney and arterial degeneration probably explains the important part played by this disease in the production of chronic valvular lesions. The in-

fluence of syphilis may also be due to its tendency to induce arteritis.

Heart disease is sometimes said to be hereditary, but it is doubtful whether the apparent transmission of the disease is not due to a tendency to rheumatism, which is generally admitted to be hereditary.

The valves of the left side of the heart are, as a rule, alone affected; the tricuspid and pulmonary valves being rarely involved, except in a secondary manner, or as the result of congenital malformation or fetal endocarditis.

Chronic lesions of the mitral valves are almost always of rheumatic origin, whereas the aortic valves are very prone to degenerative cirrhotic processes, extending from the root of the aorta (atheroma, arterio-sclerosis). The fibrous thickening leads to puckering and distortion of the valves, to morbid adhesions of the individual segments or to shortening of the chordæ tendinæ, whereby the efficiency of the valves is more or less impaired. A growth of vegetations is very liable to supervene on old fibrous induration of the valves, especially where rheumatic attacks recur from time to time. Small hernial protrusions or aneurysms are occasionally developed in the valves, and rupture of these sacs may give rise to incompetence of the valve.

Fibrinous deposits may form on the surface of the valves or in the dilated chambers. When complete closure of the valves is in any way prevented, some of the blood regurgitates or escapes backwards against the current of the circulation, and we then speak of incompetence or insufficiency of the valve. If the lesion cause interference with the passage of blood through the ostium, the condition is described as stenosis, obstruction, or constriction. The two conditions are generally combined in varying proportions. Incompetence without obstruction is not uncommon, depending on contraction or ulceration of the margins of the valves, but stenosis is nearly always associated with some degree of insufficiency.

DISEASE OF THE AORTIC VALVES.—

1. Aortic Incompetence.—*Pathology.*—The morbid change usually consists in retraction of the edges of the rigid and thickened valves. A growth of vegetations, dilatation of the aorta, adhesions of the valves to the aortic wall, laceration, rupture or perforation of the valves, are less common causes of incompetence. It is not unusual to find at the same time slight degrees of narrowing of the

orifice, depending on puckering or partial adhesion of the individual cusps or on the presence of vegetations.

As the result of these changes the valves do not meet accurately during diastole, and no longer fulfil their function of shutting off the blood contained in the aorta from the left ventricle. Some of the blood consequently leaks backwards through the narrow opening between the valves into the wide space of the ventricle, and meets the stream pouring in from the auricle. The eddies that are thus produced give rise to a "fluid vein," as it is called, and the oscillations of the particles of blood are attended with a blowing sound or murmur. The murmur is heard during the diastole, and the closure of the valves being interfered with, the second sound of the heart over the aorta is effaced or modified.

Effects upon the Heart and Circulation.

(1) The left ventricle, now receiving blood from two sources—viz., from the aorta as well as from the auricle, is overfilled, and its cavity becomes expanded. The dilatation of the ventricle is favoured by the fact that distension of its cavity occurs during diastole, when relaxation of its muscular walls is proceeding. Serious embarrassment of the circulation would ensue if this condition were long maintained, but inasmuch as a larger amount of blood has now to be propelled at each systole, the work of the ventricle is increased, and hypertrophy of its walls is developed. These results, as a rule, succeed one another so closely, except in the case of rupture of the valves from traumatic or other causes, that no sudden disturbance of the circulation is induced.

The object of this hypertrophy is to counterbalance the mechanical impediment to the circulation entailed by the valvular defect, and to maintain a mean pressure in the aortic system approaching the normal. In order to do this a larger amount of blood than usual must be pumped into the arteries, so as to allow for the backward leakage of a certain amount into the left ventricle. If the degree of hypertrophy be sufficient this result is secured. The systolic expansion of the arteries is consequently increased, and the pulse acquires certain characters which will be subsequently considered. The dilatation of the left ventricle and the increased intra-cardiac pressure soon react backwards on the left auricle, pulmonary circulation and right heart, and a less degree of dilatation and hyper-

trophy is induced in these chambers also. The relative proportions of dilatation and hypertrophy determine whether compensation is complete or incomplete.

Perfect compensation is at times effected, but in most cases compensation falls short of this standard, though sufficient as long as no excessive demands are made on the heart. The conditions necessary for the development and maintenance of compensatory hypertrophy mentioned in the section on myocardial disease apply here also—viz., a sufficient supply of healthy blood to the muscular tissue of the heart, and an adequate degree of general nutrition.

(2) The effects of aortic regurgitation on the circulation are displayed in the first instance by insufficient filling of the arteries, and in a less degree by the engorgement of the lungs and veins of the systemic and portal circulation. In proportion as hypertrophy is developed the tendency to arterial anæmia is diminished, and when compensation is complete no ill effects whatever may be noticeable. The strain to which the arterial walls are subjected by the contraction of the hypertrophied ventricle leads to atheromatous changes in the intima, and the loss of elasticity which results, adds to the already increased work of the ventricle. This condition of arterio-sclerosis may attain to extraordinary dimensions when hypertrophy of the left ventricle occurs, even in young persons in whom a primary arterial degeneration can be excluded.

The duration of compensation is liable to great variations, depending not merely on the state of the coronary circulation and the general quality of the blood, but also on the power of resistance possessed by the neuro-muscular tissues of the heart in different individuals, on the nature of the mechanical defect of the valves, and on the age of the patient.

When valvular disease is progressive, and in the case of young, growing persons, compensation is less likely to be long maintained. Rupture of the valves, whether traumatic or spontaneous, is naturally unfavourable to the development of compensation, as, from the suddenness with which the lesion arises, the heart has not time to accommodate itself to the altered conditions of the circulation. The slight and transient effects of experimental laceration of the valves in animals do not invalidate the truth of the above statement in the case of the human heart. It is doubtful whether traumatic rupture ever occurs

without some previous alteration in the structure of the valves. Under the most favourable conditions a time comes in all serious valvular disease when the cardiac muscle becomes exhausted from the effects of distension and overwork, and compensation reaches its limits. Increasing distension of the left ventricle not infrequently brings with it dilatation and relative incompetence of the mitral valve, which may temporarily relieve the ventricle and afford time for a brief rally on the part of the heart. The transition from the stage of compensation is shown by progressive dilatation and insufficiency of the heart, visceral stasis, cyanosis, and dropsy; in other words, by the same results that follow dilatation of the heart from primary affections of the myocardium. The muscular element is thus seen to be the determining factor, as far as compensation is concerned, in all cardiac disease, whether myocardial or valvular.

Rupture of Compensation has hitherto been considered as a very gradual process, except in the somewhat rare cases of traumatic rupture of the valves, but the same result is not uncommonly precipitated more or less acutely as the result of myocardial degeneration from any cause—over-strain, relapses of rheumatism, or acute intercurrent disease of any kind, especially pneumonia and bronchitis, effusions into serous cavities, uterine disorders (particularly pregnancy and the development of the menopause), digestive disturbances, mental anxiety, worry or overwork, and the abuse of alcohol and tobacco.

Symptoms and Course.—The symptoms of aortic incompetence, as of all valvular affections, depend on the existence and degree of compensation—that is to say, on the extent to which the mechanical defect of the valves and its consequent dilatation are counterbalanced by hypertrophy. In some cases the hypertrophy is so extensive that the effects of the valvular lesion are completely masked. The mean pressure in the aortic system does not fall appreciably below the normal, and no backward congestion ensues.

Under these circumstances great physical exertion may be undergone without difficulty. But it is the exception for compensation to be so perfect, and it usually happens in what would be regarded as well compensated cases that some dyspnoea is experienced when the work required of the heart exceeds a certain moderate standard.

Dyspnoea is less common in aortic than mitral disease, owing to the fact that pulmonary engorgement is less pronounced in the former affection. In most cases a tendency to anæmia is observed in the subjects of aortic incompetence, even when compensation is fairly satisfactory. Throbbing and noises in the head, giddiness, faintness, and flashes of light, depending upon the altered condition of the cerebral circulation, are also frequently complained of. When dilatation preponderates over hypertrophy the symptoms common to cardiac failure or insufficiency appear, dyspnoea, palpitation, a sense of depression, pain in the præcordia, together with signs of venous stasis, œdema of the lungs, and general dropsy. The signs of backward congestion develop earlier and are more marked in mitral disease, and will be further considered under that head.

The stage of failing compensation may be marked by various degrees of cardiac arrhythmia and by acceleration of the pulse, but, as before stated, there is no constant relation between arrhythmia and failure of the heart's contractile power; and disturbance of the heart's rhythm is seldom pronounced in aortic disease.

Complications.—Pericarditis, angina pectoris, cardiac asthma, embolism, thrombosis of the heart, hydrothorax, ascites, and general dropsy may complicate cases of aortic incompetence. Large effusions into the pericardium, pleura, or peritoneal cavity are very grave complications, owing to their interference with the heart's action and with the movements of the diaphragm.

Enlargement of the left ventricle at times is sufficient to cause collapse of the lower lobe of the left lung, owing to the pressure which it exerts, and thus increases the dyspnoea by curtailing the respiratory surface of the lung. The œdematous skin of the scrotum and lower extremities is very liable to erysipelas and other forms of spreading inflammation. Death commonly ensues with œdema of the lungs, general dropsy, and asthenia, but a sudden termination may occur, and is more often observed in aortic incompetence than in any other valvular affection. This may be due to anæmia of the brain or to diastolic arrest of the heart from over-distension of the ventricle. In exceptional cases sudden death may be the result of embolism of the coronary artery, or of cerebral hæmorrhage, depending on rupture of a

small aneurysm or some atheromatous branch of an intra-cranial artery. Gangrene of the extremities is an occasional consequence of embolism. Mental derangement of the melancholic type sometimes develops.

Physical Examination of the Heart.

— *Inspection* shows displacement of the apex beat outwards and downwards, with diffused pulsation and bulging of the præcordia.

Palpation detects forcible, heaving impulse over the left ventricle, and occasionally a diastolic thrill at the base of the heart, or over the lower end of the sternum. When the amount of regurgitation is extreme, and compensation has failed, there may be a diastolic impulse at the apex.

Percussion.—The cardiac dulness is increased outwards and downwards, but not in other directions as a rule. The dulness may, however, when the right ventricle has undergone secondary enlargement, extend further to the right than the normal line, which corresponds with the left edge of the sternum, or when the increased size of the left heart has led to displacement of the right ventricle, towards the corresponding side.

Auscultation.—At the base of the heart and down the sternum a diastolic murmur is heard, wholly or partially replacing the second sound of the heart. This murmur, which is usually blowing and high pitched in character, and may at times be musical, is often heard all over the sternum, and even at the apex of the heart. The area of maximum intensity usually corresponds with the left margin of the sternum between the third and fifth ribs, or with the mid-sternum. The murmur is frequently inaudible above the third rib, and at times it is louder at the ensiform cartilage than elsewhere. The fact that the diastolic murmur is heard with greater loudness below and to the left of the aortic valves is to be explained partly by the conducting qualities of the sternum, which lies immediately over the valves, and also by the propagation of the murmur in the axis of the blood-stream regurgitating into the left ventricle from the aorta. The presence of a second sound with the diastolic murmur shows that the valves are capable of some degree of closure, and consequently that incompetence is not very extensive. Balfour believes that when the murmur is well conveyed down the sternum, and is heard at the apex, the valves are rigid and permit of a free reflux towards the

apex of the ventricle, whereas a limitation of the murmur to the immediate anatomical site of the aortic orifice indicates a more vibratile condition of the valves, attended with obstruction of the outlet.

The first sound over the aorta remains clear in uncomplicated cases of incompetence. But when, as often happens, some degree of narrowing of the orifice co-exists, or when the aorta is dilated without alteration in the capacity of the opening, the conditions for the production of a fluid vein are present, and a systolic murmur partially or wholly replaces the first sound over the aortic valves. A systolic murmur in this region may also be the result of anæmia. The diagnosis of systolic basic murmurs will receive further attention in the next section, on Aortic Stenosis. In many cases a double aortic murmur is audible.

The heart sounds at the apex may be perfectly normal, or the diastolic murmur may be heard here also. The first sound is usually clear, but it may be feeble and dull even when the efficiency of the mitral valve is unaffected. Traube explained this in the following manner: The ventricle, receiving blood from the aorta as well as from the auricle, is more rapidly filled, and the mitral curtains are floated up and come into contact before the diastole is complete; consequently, the ventricular contraction does not cause a sufficiently sudden tension of the valves to give rise to audible vibrations as usual, and the valvular element of the first sound is lost or modified. A systolic murmur at the apex may be due to actual mitral disease, or to relative incompetence of the valve from dilatation of the left ventricle.

Auscultation of large arteries, such as the carotid and femoral, sometimes reveals a double murmur (Duroziez), the result of compression of the vessel by the stethoscope, which gives rise to a fluid vein not only during the onward passage of blood past the point of constriction, but also during the diastolic reflux towards the ventricle. In other cases a diastolic murmur alone can be heard in the large arteries. A diastolic or a double murmur in the arteries is a proof that the aortic valves are highly incompetent.

The first sound in the carotid artery is often replaced by a systolic murmur when no appreciable narrowing of the aortic orifice exists and when no systolic murmur is audible in the aortic area. The murmur is believed to be due to

forceful stretching of the arterial wall by the powerful systole of the ventricle. When the valves are seriously incompetent the second sound can no longer be heard in the carotids. Traube's "double sound" in the femoral artery is no longer considered to be characteristic of aortic regurgitation, and doubts exist as to the interpretation of this sign. Some believe that it only occurs when tricuspid incompetence is also present, the first element of the sound being due to sudden tension of the valves of the femoral vein caused by the systole of the right ventricle or auricle, the second division being caused by the forcible expansion of the artery.

Pulse.—The pulse of aortic incompetence is characteristic, and has received many different names—Corrigan's pulse, water-hammer pulse, collapsing, jerking, quick or sudden pulse. Owing to the hypertrophy and dilatation of the ventricle, the volume of the pulse is large, the forcible and sudden expansion of the artery being followed by a rapid subsidence of the wave, corresponding to the diastolic emptying of the artery in two directions—viz., onwards into the capillaries, and backwards into the ventricle. The initial pressure is high, but the mean pressure in the arteries is low, which accounts for the tendency to anæmia observed in this disease. The peculiarities of the radial pulse are generally intensified by raising the arm. Sphygmograms show steep lines of ascent and descent, the apex of the tracing being very pointed.

The pulse is usually somewhat more frequent than in health, but is generally free from any form of irregularity, except in the terminal stages. The peripheral arteries are often thickened, dilated and tortuous, and their pulsations are clearly visible owing to the hypertrophy of the ventricle.

In some cases a capillary pulse may be discovered in the skin, nails, mucous membranes or retina. If the skin be gently rubbed, the flush which is produced can be seen to become slightly paler with each diastole. A systolic pulse may also occasionally be visible in the veins on the back of the hand or in other parts.

Capillary and venous pulsation are due to the fact that in consequence of the hypertrophy of the left ventricle, combined with dilatation of the small arteries, the pulse-wave is transmitted into the capillaries, or even into the veins. Neither of these conditions is patho-

gnomonic of regurgitation through the aortic valves.

The *diagnosis* of aortic incompetence usually presents little difficulty, and depends primarily on the presence of a diastolic aortic murmur, associated with signs of hypertrophy and dilatation of the left ventricle, and with the characteristic collapsing pulse. A diastolic murmur has been absent in certain cases where the aortic valves have been found after death to be distinctly incompetent. Careful and repeated examination of patients in various positions—sitting, standing, and lying down—will, however, often prevent us from failing to detect a murmur in aortic regurgitation as in other valvular diseases. The extent of the incompetence of the valves is not to be gauged by the loudness of the murmur, but the presence of a diastolic murmur in the arteries, the absence of the second sound over the aorta and carotid artery, pronounced dilatation and hypertrophy of the left ventricle, and a jerking pulse, coupled with marked anæmia and subjective cardiac symptoms, would collectively show the lesion to be a severe one.

Nature of the Lesion.—In attempting to decide whether the valvular disease is primarily due to endocarditis or to arterial degeneration, considerations of age, sex and previous diseases, as well as the condition of the patient, have to be taken into account. In young persons, especially females, and in those with a clear history of acute rheumatism, the affection is almost certainly endocarditis. In older people, more particularly in the case of men, a history of hard muscular work, gout, chronic renal disease, syphilis or alcoholic excess would point to arterio-sclerosis in the absence of rheumatic antecedents. Degenerative conditions of the peripheral arteries also possess much diagnostic importance; but it must be remembered that these changes may themselves be secondary effects of hypertrophy of the left ventricle. In cases of this description occurring in elderly patients who have had undoubted attacks of rheumatic fever it may be very difficult to decide this point.

II. Aortic Stenosis.—*Pathology.*—Aortic stenosis commonly depends on thickening, puckering and calcification of the valves or adhesion of the individual cusps, which may be the result of endocarditis or atheromatous disease of the aorta. Vegetations may also assist in producing stenosis. This

lesion is more likely to occur in elderly people.

Conditions that interfere with the passage of blood from the ventricle into the aorta also, as a rule, prevent the valves from fitting closely together during diastole. Consequently, stenosis is generally combined with a certain amount of incompetence. We are now concerned only with the comparatively rare cases in which stenosis exists alone, or distinctly preponderates over incompetence.

Effects upon the Heart and Circulation.

—When the ventricle contracts, blood is forced through the constricted opening into the wide aorta beyond, and, the conditions for the production of a fluid vein being present, a systolic murmur replaces the first sound. Owing to the rigidity of the valves preventing their complete closure, the second sound is weak or is replaced by a diastolic murmur. At times the second sound is quite inaudible where no diastolic murmur is present. The effect of aortic stenosis is to cause hypertrophy of the left ventricle without much dilatation. The intra-ventricular pressure is increased during systole, but not during the period of diastolic relaxation, as in the case of incompetence; hence the slight degree of dilatation that results. When the amount of stenosis is considerable, the arteries receive a smaller quantity of blood at each systole, the volume of the pulse becomes reduced and a condition of anæmia is developed.

In response to the increased resistance to its discharge the ventricle contracts in a slower and more prolonged manner in order to empty its cavity completely. Unless the obstruction be very great, the efficiency of the circulation is not appreciably affected, and the mean pressure in the arteries is fairly well maintained. Backward congestion develops even at a later date than in aortic incompetence, in consequence of the marked preponderance of hypertrophy over dilatation of the ventricle.

Compensation, as a rule, is longer preserved in aortic stenosis than in any other form of valvular disease, if the necessary conditions of cardiac and general nutrition are not wanting. Atheromatous obstruction of the orifices or trunks of the coronary arteries has a most injurious effect on the heart in cases of stenosis as well as of incompetence of the aortic valves, involving, sooner or later, myocardial degeneration and debility. The remarks made in the last

section concerning the duration of compensation and the causes that determine its rupture apply equally to the present affection.

Symptoms and Course.—Symptoms do not appear until the lesion reaches such dimensions that the circulation in the arteries undergoes considerable diminution. A tendency to syncope, giddiness, epileptiform attacks and other symptoms of cerebral disorder, coldness of the extremities and marked anæmia are then developed. Rupture of compensation is indicated by the signs and symptoms already described, and death may occur from the results of cardiac failure. In other instances a sudden termination may ensue from syncope, or from accidents such as apoplexy, cerebral embolism and angina pectoris.

The complications liable to arise in this affection do not differ in any important respect from those that occur in the case of incompetence.

Physical Examination.—Displacement of the apex beat and increased cardiac dullness outwards and downwards, a deliberate, but not very powerful impulse, a systolic thrill and murmur over the aortic valves are the physical signs met with in well-marked instances.

The apex beat at times is weaker than normal, although, as we have seen, hypertrophy of the left ventricle is a necessary result of the valvular lesion. Traube believed this to be due to the fact that the obstruction to the discharge of blood into the aorta hinders the systolic recoil of the heart, which, according to the theory of Gutbrodt and Skoda, is an important factor in the production of the normal apex beat. Others have supposed that the slow, deliberate contraction of the left ventricle accounts for the feebleness of the impulse.

The systolic murmur is usually loud and rasping, and is often, but not necessarily, accompanied by a thrill; it may, however, be soft, and occasionally is musical. The murmur is heard at the base of the heart, and is generally conveyed along the course of the aorta into the carotid arteries. It may also be diffused over the whole præcordia, but, on the other hand, it is sometimes confined to the right border of the sternum at the level of the second or third ribs. Occasionally the murmur may disappear from weakness of the left ventricle. The second sound over the aorta is, in most cases, either weak or replaced by a diastolic murmur. At times it may be quite inaudible.

The *pulse* of well-marked aortic stenosis is infrequent and of small volume, but deliberate and sustained. Arrhythmia is rarely observed. Sphygmographic tracings exhibit a rounded apex and a gradual ascent and descent, depending on the prolonged systole and diastole of the ventricle.

The *diagnosis* of this lesion turns, not merely on the presence of a systolic murmur over the aortic valves, but also on the condition of the left ventricle and on the nature of the pulse. The extent of the obstruction can best be estimated by attention to the last two points.

Dilatation of the arch of the aorta may be mistaken for aortic stenosis, but the detection of the pulsations of the aorta in the episternal notch, with some degree of dulness over the manubrium sterni, the larger volume of the pulse and the fact that the second aortic sound is invariably accentuated unless the valves be incompetent, will enable us to recognize the former affection.

The systolic murmur sometimes heard in sacculated aneurysm of the arch can hardly be attributed to aortic stenosis if the pressure signs of aneurysm be not overlooked. Attention to the character of the pulse and to the state of the left ventricle will generally prevent a wrong interpretation being put on the systolic basic murmur of anæmia.

DISEASE OF THE MITRAL VALVE.—
III. Mitral Incompetence.—*Pathology.*
—Incompetence of the mitral valve—one of the commonest of all valvular lesions—is, in most instances, the result of contraction of the free edges of the curtains or of shortening of the chordæ tendinæ.

Rupture of the chordæ or cusps adhesion of the valves to each other or to the cardiac walls, perforation of the curtains and a growth of vegetations may also produce the same effect. Contractile lesions of the mitral valve may be said to be invariably due to chronic endocarditis. Atheromatous patches are not unfrequently met with, especially in the large anterior flap, but it is doubtful whether atheroma is ever a direct cause of derangement of the mitral valve. Relative incompetence is frequently brought about by dilatation of the left ventricle and relaxation of the papillary muscles and of the muscular fibres surrounding the mitral orifice. The fibrous structure of the valve curtains does not admit of the same degree of distension, and in consequence the flaps no longer fit accurately together.

Effects upon the Heart and Circulation.

—The function of the mitral valve is to shut off the left auricle from the left ventricle during the systole of the latter.

When the efficiency of the valve is unaffected the curtains are gradually floated up during the latter part of diastole, and are brought into contact at the commencement of the ventricular systole. The blood contained in the ventricle is then driven in the direction of least resistance—viz., into the aorta.

Closure of the mitral valves is assisted by simultaneous contraction of the papillary muscles and of the muscular fibres, which partially encircle the mitral orifice, so that the diameter of the opening is greatly reduced during systole. At the same time the systolic shortening of the papillary muscles prevents the flaps from being forced backwards into the auricle by the increased pressure in the ventricle.

The sudden tension to which the mitral valves are subjected by their closure gives rise to audible vibrations which constitute one factor of the first sound of the heart. When the accurate approximation of the mitral segments is interfered with by any of the morbid changes just enumerated, some of the blood which ought to be pumped from the ventricle into the aorta escapes backwards against the current of the circulation into the auricle.

The regurgitant stream flowing through the narrow slit separating the imperfectly closed valves into the wider space of the left auricle comes into collision with the onward current entering from the lungs. A fluid vein is produced, and a murmur is heard during the systole of the ventricle. Owing to the regurgitation of blood from the ventricle, the left auricle at the end of diastole contains the normal volume of blood received from the lungs plus the amount that has leaked backwards from the ventricle. This increase in the contents of the auricle involves dilatation, and, as the mass of blood to be discharged at each auricular systole is augmented, hypertrophy is superadded. As the result of the increased capacity of the auricle a larger quantity of blood than usual is now thrown into the left ventricle during diastole. Dilatation of the ventricle ensues, and, in consequence of the extra work thrown on this chamber by the increase in the volume of blood that has to be propelled at each systole, hypertrophy is also developed.

Simultaneously with these changes in the left heart, dilatation and hypertrophy

of the right ventricle and auricle are induced by the engorgement of these cavities necessitated by the derangement of the mitral valve. The pulmonary artery and veins undergo dilatation, the capillaries become distended and varicose, and a condition known as "brown induration of the lung" results.

From what has been said it will appear that the effects of mitral incompetence can only be compensated by hypertrophy on the part of the right and left ventricles. The walls of the auricles are so thin that hypertrophy in their case plays comparatively an unimportant rôle.

Turning now to the effects of the valvular lesion on the peripheral circulation we can see that so long as the hypertrophy of the two ventricles is sufficient to neutralise the leakage at the mitral orifice, the volume of blood discharged into the aorta at each systole does not appreciably decline and the circulation is therefore not interfered with. The conditions necessary for the development of hypertrophy and the circumstances that determine the duration of compensation have been described in speaking of aortic disease and need not be repeated. This state of things may last for years, but in most cases compensation is less perfect and the volume of blood discharged from the ventricle at each systole, and the pressure in the aortic circulation undergo some diminution. As a necessary result the pulmonary circulation and right heart become overfilled. This backward congestion may remain limited to the lesser circulation and right ventricle for a considerable time, and beyond a tendency to dyspnoea on extra exertion, dependent upon the high tension in the pulmonary vessels, the patient may present no symptoms of circulatory disorder. Sooner or later this stage is passed, and engorgement of the veins of the portal and systemic circulation is established, frequently culminating in dropsical effusions.

This period, which corresponds to the stage of progressive cardiac dilatation and definite failure of compensation, is commonly associated with relative incompetence of the tricuspid valve which has its origin in the increasing distension of the right ventricle. Rupture of compensation may be the direct result of progressive incompetence of the mitral valve, or of debility and dilatation of the right ventricle, in which case it is generally a very gradual process. On the other hand, failure of the heart may be precipitated acutely by the various

causes mentioned in the case of aortic incompetence.

In most cases the valvular disorder and compensatory changes go hand in hand, the development of the former being very gradual.

When incompetence is abruptly induced or when it undergoes a sudden increase in consequence of rupture of some portion of the valvular apparatus, as in certain cases of malignant endocarditis, derangement of the circulation is developed acutely and less time is given for the heart to accommodate itself to the altered conditions under which its work has to be carried on.

Symptoms and Course.—During the stage of compensation there may be no symptom of any kind, and the patient may be quite unaware of the existence of disease. It is more usual, however, to find that slight degrees of dyspnoea are evoked by any unwonted exertion even in compensated cases. This tendency is more marked in mitral than in aortic disease, owing to the inevitable rise of pressure in the pulmonary capillaries entailed by lesions of the former valve. The overfilled condition of the lesser circulation and of the bronchial veins predisposes to bronchitis, and attacks of this kind are very commonly the determining cause of rupture of compensation. The onset of cardiac failure is evidenced by the symptoms of myocardial debility which have so often been described, dyspnoea, palpitation, a sense of oppression, cyanosis and congestion of the viscera.

The subjects of mitral disease often present a dusky-red or bluish colour about the cheeks, lips, nose, ears, and tips of the fingers and toes. Venous stigmata are also frequently present on the face. The conjunctivæ are anæmic, and not infrequently somewhat yellowish, the same icteric tint being observed in the skin. In other cases the complexion has a pale, ashy hue, suggesting imperfect aëration of the blood. Purpuric skin eruptions, mainly involving the lower extremities, may arise during the later stages of the disease.

The presence of fully developed signs of failing compensation does not preclude the possibility of recovery. Patients with great cardiac dilatation, cyanosis, visceral congestion and dropsy may, in a few weeks, be restored to comparative health by timely and suitable treatment. As a rule the danger increases with each successive attack of cardiac failure, and recovery is wont to

become gradually less perfect. The fatal termination is usually reached by a process of slow asphyxia, depending on the progressive dilatation and enfeeblement of the heart, more particularly of the right ventricle. The development of Cheyne-Stokes' respiration is at times the precursor of the end. Sudden death is decidedly uncommon.

The effects of venous stasis are commonly so pronounced in mitral disease that some mention may be made of them again at this point.

Pulmonary.—Dyspnoea, the cardinal symptom of pulmonary engorgement, is often associated with a troublesome cough and a profuse watery secretion. Hæmoptysis may occur as the result of rupture of small vessels or of embolic infarction, secondary to thrombosis of the right heart. Signs of bronchitis or of oedema confined to, or most marked at, the bases of the lungs, and an accentuated pulmonary second sound, are also significant of pulmonary engorgement.

Portal.—Tenderness and enlargement of the liver with persistent dyspepsia, evidenced by irregular action of the bowels (constipation and diarrhoea alternating), nausea, flatulence, and epigastric pain, are sometimes very early signs of disturbed compensation.

Renal.—Quantitative as well as qualitative changes in the urine often furnish most valuable information concerning the vigour of the circulation. A reduction in the amount of urine in a case of cardiac disease, whether accompanied or not by albuminuria, shews that the circulation in the glomeruli is at a low ebb, and that the waste products of metabolism are being excreted in diminished quantity.

In some cases it may be difficult to determine whether albuminuria and dropsy are primarily cardiac or renal. The presence of granular casts and of a large amount of albumen in the urine, together with a waxy, anæmic tint of the skin, point to the kidney as the organ mainly concerned. In certain instances, however, a decision may be impossible. The gradual ascent of the dropsical effusion from the lower extremities to the upper parts of the body, and conversely, the earlier appearance of oedema of the eyelids and face, may help us to a correct conclusion. Unfortunately, the statements of patients as to the order in which different symptoms have occurred, are not always reliable. It should also be remembered that renal and cardiac disease may co-exist. These

difficulties are less likely to occur in the case of mitral than aortic affections, the latter being more frequently associated with cirrhosis of the kidney and arterial degeneration.

Uterine engorgement not uncommonly leads to disorders of menstruation. Sterility is by no means rare.

The complications that are apt to occur in mitral disease do not differ from those to which aortic cases are liable, with the exception of angina pectoris, which seems to be almost unknown. At the same time, the tendency to engorgement of the viscera and to dropsical effusions is far more pronounced in lesions of the mitral valve.

Physical Examination of the Heart.

—**Inspection.**—The apex beat is displaced outwards, and bulging of the præcordia may be observed in young persons with elastic chest walls.

Palpation.—Diffused forcible pulsation is felt, sometimes more marked towards the sternum and in the epigastrium—i.e., over the right ventricle. A systolic thrill is occasionally perceptible at the apex.

Percussion.—The area of cardiac dullness is increased outwards and somewhat upwards at first, and when the enlargement of the right ventricle is considerable, the dullness may extend across to the right border of the sternum, or even further in this direction.

Auscultation.—At the apex a systolic murmur is heard, wholly or partially obscuring the first sound. The second sound in this region may be clear, weak, or inaudible, and when stenosis co-exists, a diastolic or præstolic murmur may be superadded. The heart sounds in the aortic area are unaltered. The pulmonary second sound is accentuated, and at times reduplicated. The systolic murmur is sometimes very loud, and may be heard all over the præcordia. In exceptional cases the point of maximum intensity of the murmur may be situated as high as the third rib or second intercostal space, close to the sternum. The murmur is generally conveyed outwards towards the axilla, and is often heard at the angle of the left scapula. When it is very loud it may be audible over both scapulæ, or even over the whole thorax.

The displacement of the apex beat to the left is partly the result of the hypertrophy and dilatation of the left ventricle, but it is also indirectly due to the enlarged condition of the right ventricle, which by its increased weight causes the heart to assume a more horizontal position, and tilts the apex outwards. When

the degree of regurgitation is considerable, and more especially when the vigour of the left ventricle is preserved, the systolic apex murmur is generally well conveyed to the angle of the left scapula—i.e., in the axis of the blood-stream regurgitating into the left auricle. In those cases where the murmur is heard louder over the position of the mitral valve itself—viz., at the third left costo-sternal articulation—than at the apex, it is probable that the cause is to be found in great dilatation of the left auricle and in retraction of the edge of the left lung, allowing the dilated auricle to approach closer than usual to the front of the chest. In the terminal stages the development of relative incompetence of the tricuspid valve is often revealed by the appearance of an independent systolic murmur over the ensiform cartilage, and by systolic pulsation of the distended jugular veins.

The characteristic murmur may occasionally be absent in cases of mitral incompetence, where great debility of the left ventricle exists.

Pulse.—The pulse shows no abnormality during the stage of compensation, but when failure commences the pulse-wave becomes smaller, the tension is lowered, and various degrees of arrhythmia appear. Inequality of volume of the individual beats is of more serious import than mere intermission, where some beats are dropped at intervals.

Sphygmographic tracings do not show any characteristic features in mitral incompetence.

Diagnosis.—A systolic apex murmur, enlargement of the right ventricle and accentuation of the pulmonary second sound are the characteristic signs of mitral incompetence.

In attempting to estimate the extent of the valvular lesion, more importance is to be attached to the evidence of its secondary effects on the heart and circulation, than to the character of the murmur.

IV. Mitral Stenosis.—*Pathology.*—Obstructive disease of the mitral valve is nearly always a chronic process depending upon fibrous thickening and contraction of the valvular ring, and adhesion of the curtains to one another, whereby the orifice is often reduced to a mere chink or fissure, “the button-hole type”; or again, stenosis may be due to thickening and shortening of the chordæ tendineæ, which draw down the margins of the thickened and adherent valves towards the floor of the ventricle, “the funnel-shaped variety.” Combinations

of the two forms are frequently met with. These changes are the effects of a gradual fibrous thickening, or chronic endocarditis. Luxuriant vegetations may occasionally produce obstruction, but, as a rule, they are not associated with fibrous lesions. Mitral stenosis is specially common in women, and a definite history of rheumatism is often wanting. Some authors regard the lesion as congenital in such cases, but it is, at least, equally probable that the valvular disease represents the remains of slight rheumatic attacks during childhood, which have been forgotten. It has been suggested that the fact that chorea is more common in girls than boys, may help to explain the disproportion between the sexes.

Effects upon the Heart and Circulation.

—The results of stenosis are in the main the same as those of incompetence as far as the peripheral circulation is concerned. The obstruction at the mitral opening leads to backward engorgement of the left auricle, pulmonary circulation and right heart, and to imperfect filling of the left ventricle and aortic system. The left auricle being unable to empty itself completely becomes dilated and hypertrophied, and the degree of enlargement of the right ventricle that is produced is even greater than in the case of incompetence. Similar changes are induced in the pulmonary vessels, and in the lungs in both forms of mitral disease.

The left ventricle, receiving a smaller quantity of blood than usual, has less work to do, and is commonly found in a state of atrophy after death. When the left ventricle is hypertrophied in mitral stenosis, it is probable that incompetence was the initial lesion, or that increased peripheral resistance in the arterial system (renal disease, or arterio-sclerosis), has been in operation. As the lesion of mitral stenosis almost always involves some degree of rigidity, the valves are commonly unable to meet accurately during the ventricular systole, and stenosis is complicated by incompetence. Where obstruction is the predominant condition, however, the term mitral stenosis may be employed. It is obvious that the narrowing of the orifice must hinder the passage of blood from the auricle into the ventricle during the ventricular diastole, and the blood escaping from the auricle has to pass through a narrow opening into the wide ventricle beyond. A fluid vein is consequently produced, and a murmur is

heard during the diastolic period of the cardiac cycle.

Compensation in mitral stenosis depends only to a very slight degree on the amount of hypertrophy of the thin-walled left auricle, but is determined by the condition of the right ventricle on which the stress of the intra-cardiac circulation mainly falls. The pulmonary engorgement is greater in stenosis than in incompetence, and rupture of vessels and profuse hæmoptysis are far more often observed in the former affection. When the mitral constriction is slight, and hypertrophy of the right ventricle is adequately developed, the amount of blood thrown out into the aorta at each systole does not fall much below the average, and the circulation is unaffected. If the lesion be severe the pulse is always smaller than in health.

In cases where stenosis has existed from an early period of life, the aorta and its branches are found to be very narrow and undeveloped. This condition, known as "hypoplasia of the aortic system," increases the mechanical difficulties which the heart has to overcome, and is to be regarded as an unfavourable element.

No special mention is required of the conditions on which the duration of compensation depends, or of the circumstances which lead up to cardiac failure, after what has been said in previous sections. It may be stated, however, that rupture of compensation from pulmonary causes is even more common in stenosis than in incompetence of the mitral valve.

The *symptoms, course, and complications* of mitral disease are the same, whether the affection be obstructive or regurgitant.

Physical Examination of the Heart.

—*Inspection.*—Slight bulging of the præcordia may sometimes be detected, and the apex beat is slightly displaced outwards.

Palpation discovers diffused forcible pulsation over the right ventricle, and a præ systolic thrill is frequently felt at the apex.

Percussion.—The area of cardiac dullness is increased upwards to the right, and in a less degree to the left also.

Auscultation.—At the apex a præ systolic murmur is heard running up to the first sound, which is short and abrupt, resembling the normal second sound. The second sound at the apex may be audible, and is not unfrequently reduplicated at this point, as well as over the

right ventricle and the pulmonary artery. The pulmonary second sound is accentuated. At times the murmur may be prolonged almost throughout the whole diastole, commencing directly after the second sound, and becoming rougher and louder during the latter part of the diastolic period. The early diastolic and the præ systolic portions of this murmur are occasionally separated by a brief interval. In rare cases a murmur may be heard during the commencement of the diastole alone, as in the case of aortic regurgitation. The præ systolic murmur is frequently confined to the immediate neighbourhood of the apex, though at times it may be diffused widely over the præcordia. Except in cases of this description, where the murmur is generally very loud, it is rarely heard at the angle of the left scapula, and, unlike the systolic mitral murmur, it is not conveyed towards the left axilla. The præ systolic murmur is generally low-pitched, rough, and churning, but it is subject to great variations of pitch and quality.

In order to understand the method of production of this murmur it must be remembered that the long pause of the cardiac cycle comprises not merely the active dilatation of the ventricle, but also the short period of auricular contraction which immediately precedes the systole of the ventricle.

The occurrence of the murmur just before the first sound is to be explained by the sudden acceleration of the blood current through the narrowed mitral orifice caused by the contraction of the left auricle, the flow during the earlier portion of the diastole being comparatively noiseless, owing to the low pressure at which the blood pours into the left ventricle. The presence of an early diastolic murmur is probably due partly to the suction action of the actively dilating ventricle, and partly to the high tension existing in the pulmonary circulation.

The loudness of a murmur depends less upon the size of the orifice than upon the rapidity with which the fluid passes through it. Hence the degree of hypertrophy of the left auricle, the pressure in the pulmonary veins, and the activity with which the left ventricle dilates during diastole, are the conditions which mainly determine the existence or loudness of the murmur of mitral stenosis. The second sound at the apex usually disappears when narrowing reaches a certain point; the præsys-

toxic murmur and abrupt short first sound persisting.

Absence of the second sound is explained by Broadbent by the overlapping of the left apex by the enlarged right ventricle, and by the weakening of the aortic second sound consequent upon the low pressure in the systemic arteries. In the later stages the præ systolic murmur frequently, if not always, vanishes, a short, sharp first sound or a systolic murmur alone being audible. At the same time the accentuation of the pulmonary second sound commonly disappears, owing to the development of tricuspid incompetence, which involves a reduction of blood-pressure in the vessels of the lungs.

In many cases of mitral stenosis no præ systolic or diastolic murmur can be detected, and a systolic apex murmur or a short, sharp first sound or a slight "prefix" to the first sound may be the only auscultatory evidence of mitral disease. The systolic murmur is frequently accompanied or preceded by a short thump, which some regard as the last portion of a præ systolic murmur, but which is more probably the modified first sound of mitral stenosis. When, in cases of this sort, the second sound is reduplicated and the systolic murmur is not well conveyed towards the axilla and back, the existence of mitral stenosis is very probable, and the degree of incompetence is slight. Reduplication of the second sound is more common in mitral stenosis than in any other condition, but this sign cannot be regarded as pathognomonic of mitral narrowing. A cantering rhythm, or "bruit de galop," in which three indistinct heart sounds are audible, is not uncommonly observed in this affection, but a similar rhythm may be developed in other diseases. It is easy to see why a systolic murmur should occur in mitral stenosis, owing to the incompetence which almost invariably co-exists, but it is not so easy to account for the numerous cases of combined stenosis and incompetence in which no systolic murmur is heard. The high tension in the pulmonary circulation and left auricle, as contrasted with the low pressure in the aorta, may explain the absence of a systolic murmur; for the blood in the left ventricle, flowing in the direction of least resistance, pours freely into the aorta, whereas the amount that escapes backwards into the distended auricle is comparatively trifling (Broadbent). The reduplication of the second sound is believed to be due to

asynchronous closure of the aortic and pulmonary valves, in consequence of the different degrees of tension existing in these vessels. The peculiar short, sharp first sound has been explained by the supposition that, the pressure in the left ventricle during diastole being very slight, the mitral valves are brought together with greater suddenness than in the normal condition, where the amount of blood entering the ventricle is larger and the curtains are floated up more gradually.

The præ systolic murmur may only be audible when the patient is in the recumbent position, and the examination of all doubtful cases in various postures is even more necessary in mitral stenosis than in any other form of valvular disease.

Pulse.—During the period of compensation there may be no appreciable change beyond perhaps a slight reduction in volume. In advanced stages the pulse becomes small and the tension usually falls. Occasionally the arterial pressure may be somewhat increased, possibly from the occurrence of vasomotor contraction in response to the imperfectly oxygenized state of the blood. When compensation fails the pulse frequently exhibits even more extreme degrees of arrhythmia than in mitral incompetence. Irregularity has been considered by many writers to be specially characteristic of mitral stenosis, and in the later stages this is no doubt perfectly true. But while compensation is preserved it is by no means common to find arrhythmia in this disease.

Derangement of the heart's rhythm in organic disease, as before stated, is largely the result of debility of the cardiac muscle, and secondarily of disordered innervation. Hence the development of arrhythmia is always a matter of importance, as it often conveys a timely warning.

The frequency of the pulse is generally somewhat increased even in compensated cases, and, when failure commences, the heart's action is almost always considerably accelerated. Beyond recording different varieties of arrhythmia the sphygmograph does not usually supply any information that cannot be obtained by other means.

Diagnosis.—A præ systolic murmur at the apex of the heart is the pathognomonic sign of mitral stenosis, but the severity of mitral obstruction is to be gauged mainly by the degree of enlargement of the right ventricle, by the amount of visceral engorgement and

by the volume of the pulse. Stenosis may be regarded as being less extensive when the two sounds of the heart are heard at the apex, in addition to the præsystolic murmur, than when the second sound is obscured at this point.

The quality of the murmur does not possess much significance, and it may be said that loudness of murmur in this as in all valvular disease points to hypertrophy, and therefore to compensatory changes.

VALVULAR DISEASE OF THE RIGHT SIDE OF THE HEART.—Primary affections of the valves of the right heart, except as the result of congenital disease, are almost unknown. Secondary lesions are less uncommon, especially in the case of the tricuspid valve.

V. Pulmonary Incompetence.—*Pathology.*—This, which is the rarest of valvular diseases, may depend on congenital abnormalities—*e.g.*, where there are only two semilunar valves, or in cases of acquired disease, it may develop in consequence of similar changes to those which occasion aortic incompetence. The small vegetations which not unfrequently develop on the pulmonary cusps in old-standing endocarditis of the left heart rarely give rise to functional derangement of the valve. Malignant endocarditis occasionally leads to pulmonary incompetence.

Effects upon the Heart and Circulation.—The effects of this lesion are seen in dilatation and hypertrophy of the right ventricle and to a less extent of the right auricle, and in distension of the systemic and portal veins. A patent foramen ovale and imperfect closure of the ventricular septum have been noted in some congenital cases. Communication between the two sides of the heart appears to be favourable on the whole, as the engorgement of the venous system is thereby diminished and the left ventricle receives a better supply of blood.

The *symptoms* proper to this very rare affection cannot be said to be well known, more particularly as emphysema, bronchitis and other pulmonary complications generally co-exist.

The *course* and mode of termination are the same as in severe disease of the lungs or of the mitral valve.

Physical Examination of the Heart.—The physical signs of pulmonary incompetence* are these:—Dilatation and

hypertrophy of the right ventricle, and a diastolic murmur in the pulmonary area, conducted down the left edge of the sternum to the ensiform cartilage.

The *pulse* is small and may be irregular.

Diagnosis.—The absence of signs of dilatation and hypertrophy of the left ventricle, and of a typical collapsing pulse, and the presence of the second sound in the carotid arteries are the chief points that may be relied upon to distinguish pulmonary regurgitation from incompetence of the aortic valves.

VI. Pulmonary Stenosis.—*Pathology.*—Stenosis may very occasionally be the result of chronic endocarditis or a growth of vegetations, but, with the rarest exceptions, it owns a congenital origin. This lesion may then be the result either of fetal endocarditis involving the valve segments, or of a ring-shaped fibrous thickening and contraction of the conus arteriosus (the portion of the ventricle immediately below the valves), or it may be a consequence of developmental malformation. The trunk of the pulmonary artery may be narrowed for a considerable distance beyond the valves, especially in congenital cases.

A patent foramen ovale, incomplete ventricular septum and persistent ductus arteriosus are very commonly associated with pulmonary stenosis. It is impossible to enter into the details of these conditions here, as the interest and importance which they possess are rather anatomical than clinical.

Effects upon the Heart and Circulation.

—The effects of stenosis are practically the same as in the case of incompetence of the pulmonary valves.

When stenosis is extreme, and when atresia or actual occlusion exists, the right ventricle may be small and undeveloped. In such cases death generally occurs soon after birth.

Symptoms and Course.—The symptoms of pulmonary constriction are mainly dyspnoea and varying degrees of cyanosis. When the lesion is congenital the disposition to cyanosis, particularly on exertion, is usually very marked, and the fingers and toes are often extremely clubbed. The patients rarely live more than ten or twelve years, though in a very few exceptional instances life has been prolonged to a comparatively advanced age. The growth of the body is always more or less interfered with, and the subcutaneous fat and muscles are imperfectly developed. In severe cases dyspnoea and cyanosis appear

* Cf. a case of this description with post-mortem examination by Sir Dyce Duckworth, (*lin. Soc. Trans.*, vol. xxi., 1888. The patient was a male, aged forty-nine.

directly after birth, but occasionally these symptoms do not develop till about the period of puberty.

The course of the disease is nearly always progressive, the patients generally succumbing to pulmonary complications.

Complications.—It is a remarkable fact that the subjects of this affection are very liable to contract chronic pulmonary tuberculosis.

Physical Examination of the Heart.—Physical examination reveals signs of enlargement of the right ventricle and a systolic murmur in the pulmonary area. The murmur is often harsh and audible over the whole præcordia, but at times it may be very faint. The point of maximum intensity is situated close to the left margin of the sternum, in the second intercostal space or at the level of the third rib. The murmur is not conveyed along the aorta into the carotids, but is generally propagated upwards towards the left clavicle, and may sometimes be heard over the back. The pulmonary second sound is weak, and when incompetence exists there may be a diastolic murmur.

A systolic thrill in the pulmonary area is commonly present.

In some cases of pulmonary stenosis no systolic murmur can be heard.

The *pulse* is weak, small, and may be irregular.

VII. Tricuspid Incompetence.—

Pathology.—This affection may be the result of endocarditis or of dilatation of the right ventricle and tricuspid orifice. In the former case the valvular derangement is produced by similar changes to those that have been described under the head of *Mitral Incompetence*, and the tricuspid lesion is almost invariably secondary to endocarditis of the left heart. Relative incompetence is far more common, and may supervene not only on affection of the mitral and aortic valves, but also on dilatation and debility of the left or right ventricle from whatever cause.

Effects upon the Heart and Circulation.

—Tricuspid incompetence leads to dilatation and hypertrophy of the right ventricle and auricle, distension of the systemic and portal veins, and ultimately to cyanosis and dropsy. This valvular defect can only be very imperfectly counterbalanced by hypertrophy and dilatation of the right ventricle and auricle; hence compensation is never adequate, and a condition of venous engorgement and arterial anæmia are

rapidly induced. The development of tricuspid insufficiency, therefore, greatly aggravates the effects of any existing valvular disease, and is always a matter of considerable gravity.

Symptoms and Course.—The symptoms of the tricuspid affection are almost always merged in those of the primary disease, and are represented by an increased tendency to venous stasis, cyanosis and dropsy. Where incompetence is relative, recovery may take place if the obstruction to the intracardiac circulation in front can be removed or diminished. Regurgitation due to structural changes in the valve is a most serious condition, and generally proves fatal at an early date, the mode of termination resembling that of mitral disease.

Physical Examination of the Heart.—

The physical signs of incompetence of the tricuspid valve are :—A systolic murmur heard loudest over the ensiform cartilage or at the lower end of the sternum, signs of enlargement of the right ventricle and weakening of the pulmonary second sound. The jugular veins are overfilled, and often exhibit systolic pulsation.

When the veins become stretched beyond a certain point their valves give way, and the regurgitant wave, entering the right auricle from the ventricle, passes into the jugulars, which therefore pulsate synchronously with the ventricular systole. If the degree of regurgitation be small, or if the ventricle contract feebly, venous pulsation may be absent. Incompetence of the jugular valves may be detected by compressing the vein high up in the neck and observing that it fills from below. The enlarged jugular veins may also show slight oscillations when their valves are intact and when no tricuspid incompetence exists, owing to the contractions of the auricle or ventricle being transmitted to the column of blood in the distended veins. The oscillations may therefore be either præ systolic or systolic. It is believed that the systolic expansion of the aorta may be communicated to the vena cava superior, and from thence to the innominate and jugular veins. If the veins pulsate strongly, and if their valves be incompetent, tricuspid insufficiency probably exists, but systolic jugular pulsation is not pathognomonic of this valvular lesion. The regurgitant stream, entering the right auricle, is also transmitted through the vena cava inferior to the hepatic

veins, which have no valves, and the liver sometimes can be felt to undergo systolic expansile pulsation, which is not to be confounded with the communicated pulsation which is so common in this region.

Pulse.—The pulse of tricuspid incompetence is small, weak, and frequently irregular.

VIII. Tricuspid Stenosis.—*Pathology.*—This condition is far more rare than incompetence, and, except in a few instances when it is congenital and associated with other malformations of the heart, it is always secondary to valvular disease of the left side, and almost invariably to mitral stenosis.

The effects of the lesion are very similar to those of tricuspid incompetence, and compensation is impossible.

The symptoms and course of the disease may be inferred from the description contained in the last section.

Physical Examination of the Heart.—A præstolic murmur, heard best over the ensiform cartilage, or somewhat to the left or right of this point, is the characteristic physical sign.

A thrill, præstolic in time, may occasionally be felt in the same position.

IX. Combined Valvular Disease.—The frequent association of stenosis and incompetence of the various valves has been emphasized more than once, though for the sake of convenience the individual affections have been considered separately.

The presence of these combined lesions is indicated by the *physical signs* proper to each.

The *diagnosis* of combined valvular disease turns not merely on the presence of the different characteristic murmurs, but also upon the secondary effects of the individual lesions on the heart and circulation generally. For instance, a small pulse in a case presenting the typical signs of aortic regurgitation should always suggest the possibility of concomitant mitral disease, even when the auscultatory evidence of the latter is equivocal or wanting. But though two or more lesions may be present in a given case, it should be stated that one frequently preponderates to such an extent as to claim almost exclusive attention.

It is worthy of note that the more chronic contractile forms of endocarditis, as a rule, lead ultimately to narrowing in the case of the mitral valve, and to incompetence when the aortic valves are concerned. The combination

of these opposite conditions of the two sets of valves is by no means rare. The frequency with which relative mitral incompetence develops in cases of aortic regurgitation has been already alluded to.

PROGNOSIS OF VALVULAR DISEASE.

—The prognosis is more favourable in aortic stenosis than in any other variety of valvular disease, owing to the marked preponderance of hypertrophy over dilatation in this affection. Incompetence of the aortic valves is a much more serious lesion, by reason of the great degree of ventricular dilatation which it occasions, together with its tendency to sudden death. Compensation is often preserved for years in both forms of aortic disease, but failure is less readily recovered from than in affections of the mitral valve. The relative prognosis in mitral stenosis and incompetence is still a matter of dispute. For practical purposes the prognosis is determined by the features of each individual case, and must be based on considerations common to all forms of valvular disease, which may be thus briefly summarised:—

State of the Heart's Wall.—The degree of enlargement and the relative proportions of hypertrophy and dilatation supply information as to the severity of the lesion and the capabilities of the cardiac muscle. Persistent arrhythmia is significant of myocardial degeneration. A history of repeated rupture of compensation suggests the probability that the cardiac muscle is becoming exhausted.

Extent and Nature of the Valvular Lesion.—The data required for estimating these points have already been mentioned in speaking of the several affections of the valves. When the lesion is extensive, and especially where it is presumably due to atheromatous changes, the prospects are serious. Degenerative vascular disease is necessarily progressive, and there is more danger of coronary obstruction, and therefore of myocardial degeneration.

Effects of the Lesion on the Circulation.—The condition of the pulse, the presence or absence of cyanosis and visceral stasis on the one hand, and of definite cardiac symptoms on the other, are the points that require special attention.

Condition of the Arteries and Viscera.

—Arterial degeneration adds to the gravity of the case, not only on account of the danger of cerebral hemorrhage, but also by reason of the increased

work which it throws on the left ventricle.

Persistent signs of hepatic and gastrointestinal derangement, albuminuria and passive bronchial catarrh, furnish evidence of serious disorder of the circulation, and are bad omens owing to the prejudicial effect on the general health which these conditions involve.

State of General Nutrition.—Anæmia and malnutrition are very apt to develop in all serious cardiac disease, owing to the baneful results of imperfect aëration of the blood and of the visceral derangements just alluded to. Preservation of a good standard of general nutrition is a favourable prognostic sign.

Social Condition and Habits of the Patient.—Laborious occupations, insufficient food, anxiety, worry, or mental overwork, sexual excesses, the abuse of alcohol, tobacco, tea, or coffee, have a most injurious effect. If these unfavourable influences can be excluded, the patient's prospects are immensely improved.

Age of the Patient.—The prognosis is always serious in children before the age of puberty, owing to the strain thrown on the heart during the active growth of the body. In old people the natural tendency to degenerative changes is apt to intensify the effects of valvular disease.

Complications.—The presence or absence of complications is a matter of much importance, but it must not be forgotten that in the most favourable and uncomplicated cases serious accidents, such as cerebral embolism, may occur at any moment, and may disarrange all previous calculations.

TREATMENT OF VALVULAR DISEASE.
—The preventive treatment of valvular disease at present is very unsatisfactory. The use of salicylic acid and its salts is generally believed to have little influence in hindering the occurrence of endocarditis, but nevertheless subacute relapses of rheumatism ensuing in the course of established valvular disease should always be promptly and carefully treated by rest and suitable drugs, as such outbursts are very apt to be associated with the development of a fresh crop of vegetations. In the case of valvular affections secondary to arterial disease we may hope for more results from prophylactic measures, considering the close relationship that subsists between atheroma and such influences as over-exertion, alcoholism, gout, and syphilis.

Stage of Compensation.—During this period drugs are seldom required, and treatment should be mainly prophylactic and hygienic. Patients should avoid excesses of all kinds, whether physical, mental, emotional, or sexual. The diet should be moderate, but nutritious and digestible. Wine or beer in small quantities may be allowed unless the tension of the pulse be high, in which case alcohol should be altogether eschewed. Tobacco, from its weakening action on the heart, must be used with great moderation. Warm clothing, and especially flannel next the skin, should be worn. Prolonged immersion in cold or hot water, and Turkish baths must be forbidden. Regular gentle exercise, gradually increased, is of great service on account of its beneficial effect on general nutrition and on the coronary circulation. As long as the patient experiences no dyspnoea, walking, riding and shooting, may be indulged in with advantage. In persons of sedentary habits still greater caution is required, and physical exertion must be more carefully undertaken.

The intelligent co-operation of the patient is especially needed during the stage of compensation. On the one hand, he should be informed, as far as it is thought advisable, as to the general nature of his complaint; but on the other, it is quite as important to avoid unnecessary plainness of speech, as the moral effect of being told that he is the subject of "heart disease" often takes all heart out of the patient. He should be encouraged to believe that his future is to a large extent in his own hands, and his rule of life should be "moderation in all things." Regular daily evacuation of the bowels must be secured, and in plethoric patients an occasional course of saline aperients or some corresponding mineral water may be ordered. A tendency to anæmia is an indication for iron or some chalybeate water. Functional disorders must be treated in the usual way. Sea air and health resorts at moderate elevations as a rule suit most cardiac cases, but others are sometimes benefited by a sojourn at some of the Continental or English Spas. Oertel's system of treating cardiac disease by mountain climbing has not found much favour in England, and is probably more suited to cases of moderate non-valvular enlargement of the heart, in which obesity is a prominent feature.

The question of marriage is a most important one. Women should, if possible be prevented from marrying on

account of the great risks attendant on pregnancy and parturition. In the case of men marriage may be sanctioned if compensation be satisfactory, and when there is reason to believe that the cardiac affection is likely to be stationary. At the same time, the probability that the ordinary expectation of life will not be realised must be taken into consideration.

Stage of Failing Compensation.—When dilatation and cardiac weakness begin to predominate, a careful combination of specific cardiac remedies, with other measures both general and local, is called for. In the first place, complete rest in bed must be insisted upon. Light nutritious food should be given in small quantities and at short intervals, and a regular action of the bowels must be secured.

Among cardiac drugs none can compare with digitalis for general usefulness.

The effect of *digitalis* is exerted both on the general circulation and on the heart itself. On the one hand it raises the tension in the arteries, and on the other it slows the action of the heart, and increases the force of the individual contractions. Failure of the heart's contractile power, with signs of dilatation, low arterial pressure, and a small and rapid pulse, are therefore the special indications for the use of digitalis. The good results of this medicine are more conspicuous in mitral than aortic cases, and objections have been raised to its use in aortic incompetence, on the ground that the lengthening of the diastole leads to still further distension of the left ventricle, and the increased force of the cardiac contractions, coupled with heightened arterial tension, adds to the risk of cerebral hæmorrhage. Against this view it must be stated that during the period of cardiac dilatation an increase in the force of the ventricular systole, and a rise of arterial pressure, are of great advantage, inasmuch as the arteries are always more or less empty between the beats—*i.e.*, the mean pressure is low, even in fairly well compensated cases of aortic regurgitation, and when the left ventricle begins to fail the arteries are of course even less adequately filled. And it must be remembered that a steady and continuous flow of blood through the capillaries, which is the end and object of the circulation, is determined, not by the initial, but by the mean pressure in the arteries.

If the use of digitalis be strictly

limited to the stage of progressive dilatation, its results are often most satisfactory; at the same time it should be administered with great caution and in small doses to begin with in aortic disease, and as soon as its tonic effects on the heart are obtained it should be discontinued. The beneficial action of the drug is also manifested in the relief of visceral congestions and their consequences—dyspnoea, bronchitis, deficient secretion of urine and dropsical effusions.

In mitral cases, where dilatation is pronounced, the infusion in doses of 2 to 6 drachms, or an equivalent amount of the tincture or powder, may be ordered every three or four hours for a few days until the effects of the drug appear, medicinal treatment being then suspended for a time altogether. Owing to the so-called cumulative action of digitalis, symptoms of poisoning sometimes develop with very little warning. When, therefore, a patient complains of nausea or vomiting, and the pulse becomes weak, small, and irregular, and the quantity of urine declines, the drug must be at once stopped, and if collapse be threatened, brandy, ether, and ammonia should be exhibited till the heart's power is restored. In some cases the maximum effects of digitalis are not obtained for twenty-four hours or more after its administration has been suspended. Diuresis and removal of oedematous swellings are among the most striking and tangible results of its successful action. The increased flow of urine is to be attributed to stimulation of the heart's contractions, and to a rise of pressure in the renal artery.

The use of digitalis in smaller doses, continued for a longer time, is to be preferred in other cases, but here also the physician must be on the watch for nausea and other toxic symptoms. At times gastric symptoms are so persistently produced that the remedy has to be abandoned. Occasionally a change to another preparation obviates the difficulty. It may here be repeated that rest is of the first importance, and in many instances of cardiac failure, especially among the poor, a few days in bed, with suitable food, suffice to restore a considerable degree of compensation.

It is very common to meet with patients who are, so to speak, on the borderland between compensation and failure, to whom digitalis in tonic doses of 10 minims of the tincture twice a day may be administered continuously for

weeks and months with the greatest advantage.

Iron may be combined with digitalis if anæmia be a prominent feature; otherwise the latter drug is better given alone, owing to the liability of iron to cause constipation. When the action of digitalis begins to fail, it may generally be inferred that the limits of compensatory hypertrophy have been reached, this result depending on the progressive nature of the valvular lesion, or on the supervention of myocardial degeneration.

Strophanthus, introduced by Fraser, closely resembles digitalis in its action, and though less generally useful, it sometimes proves an efficient substitute when the action of the latter remedy is becoming exhausted. *Convallaria*, *adonis vernalis*, and various other drugs have been recommended as possessing similar virtues, but experience has scarcely confirmed these expectations.

Strychnine, ether, and ammonia are also valuable remedies, and may be employed in all valvular affections to stimulate the action of the heart.

Belladonna is sometimes serviceable in aortic cases, and in combination with digitalis it may be advantageously prescribed in mitral disease, especially when arrhythmia is a prominent feature.

TREATMENT OF SPECIAL SYMPTOMS.
—*Dyspnœa*, when it depends upon engorgement of the pulmonary circulation, can only be relieved by improving the force of the heart (digitalis, strychnia, &c.). When it is due to bronchitis, expectorants may be combined with digitalis. The dyspnœa which occurs in connection with high arterial pressure may often be relieved by nitrite of amyl and nitro-glycerine. The last-named remedy is occasionally useful in those exceptional cases of mitral stenosis where the tension of the pulse is raised. Small hypodermic injections of morphia sometimes give great relief when all other measures fail.

Palpitation in cases of failing compensation is usually symptomatic of cardiac weakness, and here the administration of small quantities of brandy, frequently repeated, is sometimes successful. A belladonna plaster, or an ice-bag applied to the præcordia, and bromide of ammonium, may also be tried.

Cardiac pain is often benefited by arsenic, iodides, or nitro-glycerine. Local applications of belladonna and aconite are also useful.

Dropsy may be treated by diuretics, such as digitalis, caffeine, convallaria, sparteine and squill, but of these digitalis is by far the most effectual. The combination of digitalis, squill, and blue pill is sometimes of great service. Calomel in repeated doses has lately been found to act well as a diuretic in cardiac cases.

Hydragogue cathartics are often used for the same purpose, though they have a less decided effect than diuretics. Jalap, scammony, elaterium, acid tartrate of potash, and mercurial preparations are the drugs that are mostly employed. Edema of the skin may be relieved by puncture with Southey's trocars, but great cleanliness and antiseptic precautions are needed to prevent the development of erysipelas and other inflammatory affections.

Deficient secretion of urine must be treated by remedies, like digitalis, that act on the renal circulation.

Insomnia, which is often a most distressing symptom, may at times yield to paraldehyde, urethane, sulphonal, and bromides, but in troublesome cases a small hypodermic injection of morphia is the only means by which sleep can be obtained. A course of belladonna has occasionally been found by the writer to give good results.

Dyspepsia, being commonly the consequence of portal congestion, is usually benefited by mild purgatives, in combination with bitter infusions, acids, or alkalies, in different cases.

Hæmoptysis is most common in mitral stenosis, and though it alarms the patient, its effect is often salutary, and no special treatment is required.

Syncopal attacks are prone to occur in aortic cases as the result of cerebral anæmia. Brandy, ether, and ammonia may be administered, and the patient should be placed flat on the back.

The treatment of complications such as embolism, effusions into serous cavities, &c., must be carried out on general principles. The preceding remarks refer more especially to disease of the aortic and mitral valves, but affections of the right side of the heart must be treated on the same principles as those recommended in the case of mitral disease. In combined valvular affections treatment must be directed to the predominant lesion.

PERCY KIDD.

HEARTBURN is a prominent symptom of chronic gastritis, and

consists of a burning sensation generally referred to the cardiac end of the stomach, but sometimes felt all over the abdomen. Acid eructations are usually present. Careful dieting is of the first importance in the treatment. Fat, sugar, starch, and beer should be prohibited, very weak brandy-and-water being the only stimulant allowed. Alkalies may be administered with benefit.

HECTIC FEVER means literally habitual fever, but the term is now used to denote the chronic fever met with in certain wasting diseases, especially those of a tubercular nature. The temperature usually attains its maximum in the evening, and there are very marked remissions or complete intermissions in the morning. Emaciation, pallor, and night sweats are the usual accompaniments of hectic fever; often there is a bright circumscribed flush on one or both cheeks: this is known as the hectic flush.

HEMIPLEGIA.—Paralysis of one-half of the body, the result of a lesion existing in the *opposite* half of the brain.

Hemiplegia may be caused by—(1) extensive disease of the motor part of the cortex; (2) lesions of the motor fibres of the corona radiata, passing down from the cortex; (3) disease about the corpus striatum, involving the motor fibres of the internal capsule contiguous to it; (4) a lesion of the pyramidal tract in the crus cerebri and pons Varolii.

The most common cause of hemiplegia is hæmorrhage or softening about the internal capsule and corpus striatum, but although the corpus striatum has been usually described as the seat of hemiplegia, it seems probable that lesions of this body alone do not cause hemiplegia unless the internal capsule itself be involved. The portion of the internal capsule, destruction of which causes hemiplegia, comprises a small part of the anterior limb just in front of the genu and the anterior two-thirds of the posterior limb. Hemiplegia with gradual onset is also caused by tumours occurring in the above-mentioned parts of the motor tract.

Symptoms.—When, after an attack of apoplexy, the patient attempts to move the limbs, he is frequently found to be paralysed in one-half of the body. In the early stage of such an attack the patient may have conjugate deviation of the eyes, and the head may be turned towards the sound side (by the over-

action of the non-paralysed muscles), and there may be some difficulty in turning the head and eyes towards the paralysed side.

The naso-labial fold is less marked, and the angle of the mouth is lower, on the paralysed side, and there is difficulty in showing the teeth on that side; the upper part of the face is usually unaffected though in some cases there may be rather more difficulty in wrinkling the brow and in closing the eye on the paralysed side, but never to the extent observed in paralysis of the trunk of the facial nerve. The tongue, when protruded, deviates towards the paralysed side, the speech is sometimes thick and indistinct, and with right hemiplegia aphasia may be present. Slight difficulty of swallowing may exist.

The upper and lower limbs of the affected side are completely or partially paralysed, and at first are relaxed or may present the phenomenon of "early rigidity"—a condition supposed to be due to "irritation" by the lesion of the neighbouring parts of the brain.

The muscles of the paralysed limbs react well to both faradic and galvanic currents, and there is no loss or change of reaction such as is seen after lesions of the anterior cornua of the spinal cord or of the peripheral nerves. There is no marked wasting of the limbs, and no anæsthesia, unless the sensory fibres in the posterior third of the hinder limb of the internal capsule be involved. The tendon-reflexes are increased on the paralysed side, the knee-jerk (patellar-tendon reflex) being increased, and ankle-clonus being present, while the superficial reflexes (plantar, &c.) are usually diminished. The sphincters are not involved as a rule, unless there be some mental defect owing to the highest cerebral centres being involved, or in cases of double hemiplegia. The thoracic muscles and abdominal muscles escape paralysis, but at times the abdominal muscles are weak on the paralysed side.

After a few days, weeks, or even months, a gradual return of power takes place in the paralysed limbs, and in most cases the leg begins to recover before the arm, and the proximal joints of the limbs (shoulder, hip) before the distal ones (hand, foot). If the attack have been a slight one, the patient may completely recover the use of his limbs, but in a great many cases a certain amount of power returns in the shoulder and elbow, but not in the hand or wrist.

After a few weeks, the joints which fail to recover power are affected with "late rigidity," and become stiff and contracted, while at the same time the tendon-reflexes are much increased. The rigidity is due to sclerosis descending from the fibres which have been destroyed in the internal capsule down the pyramidal tract and lateral columns of the spinal cord.

In some cases the face and the upper limb are affected, and the lower limb escapes, whilst in others the lower limb is affected more than the upper, and here it is often noticed that the face is very little paralysed, and recovers very soon, while the arm recovers power before the leg. The writer considers that these cases are due to the lesion occurring in different parts of the internal capsule or the cortex, the anterior region of the motor part of the capsule being affected in the former case, and the posterior part in the latter.

In lesions about the upper part of the pons Varolii the third nerve on the *same* side as the lesion is liable to be paralysed, producing external strabismus of the eye, with ptosis—along with hemiplegia of the side *opposite* to the lesion; and in lesions of the lower part of the pons the facial nucleus of the *same* side as the lesion may be affected—causing paralysis of the whole of the face of that side, with paralysis of the arm and leg of the opposite side; this is called "cross paralysis."

With hemiplegia there is frequently hemianæsthesia of the paralysed limbs, the loss of sensibility being sharply limited by the median line. In such cases there is sometimes hemianopsia of the same side—*i.e.*, with right hemianæsthesia, the right half of the field of vision for both eyes is abolished, with loss of hearing, taste, and (?) smell on the same side as the hemianæsthesia.

Dr. Broadbent explains the paralysis of the face, arm, and leg, and the exemption of the chest and abdominal muscles, by supposing that, as both sides of the chest and abdomen are in the habit of acting together, their spinal nuclei are very intimately connected, and that both sides can be stimulated by either cerebral cortex; whereas the hand and foot are so specialised that they can only be stimulated from the cortex through their own particular spinal cells of the same side.

Diagnosis of the cause of the attack is considered under the heading of CEREBRAL HÆMORRHAGE.

With regard to the position of the

lesion producing the hemiplegia it may be said that lesions of the cortex are usually associated with epileptiform convulsions of one side, occurring during the course of the hemiplegia, and affecting the paralysed limbs (*see BRAIN, TUMOURS OF*). In such cases the paralysis is often partial and affects the face alone, or one limb only. Lesions about the pons Varolii are shown by the cranial nerves of that region being involved on the opposite side to that of the limbs.

The most common site of the lesion is in the internal capsule. It is difficult to diagnose this from disease of the corona radiata, but to produce the same amount of paralysis a much larger lesion would be required there, owing to the spreading out of the motor fibres.

Hemianæsthesia usually means that the posterior part of the internal capsule is involved, but it may be also caused by lesions of the pons Varolii.

Prognosis is bad if there be no return of power in the paralysed parts at the end of a month. Early rigidity is an unfavourable sign, especially so if it persist. When, after several weeks, there is no return of power in a limb, such as the arm, and it becomes stiff from late rigidity, with great increase of the tendon-reflexes, it is almost hopeless to expect any improvement. Hemiplegia, with a gradual onset, especially in old people, is unfavourable, as it is frequently due to softening from thrombosis. In cases in which the onset is gradual, and signs of an intra-cranial growth subsequently develop, the prognosis, is of course, very grave.

Treatment.—In the early stages of hemiplegia the patient should be kept completely at rest in bed, and the bowels attended to. The diet should be light and nourishing, and stimulants are best avoided. Later on the paralysed limbs may be rubbed, and passive moments employed, and the patient encouraged to try and move them. To prevent wasting the muscles should be faradised, but not at the outset of the case. Tonics, as quinine and iron, are useful, and nerve tonics, as strychnine and hypophosphite of soda, may be given with advantage. A history of syphilis will suggest the use of iodide of potassium and mercury. As soon as the patient is well enough he should be got into a couch or wheeled chair, and encouraged to walk when sufficient power has been regained in the leg.

C. E. BEEVOR.

HERPES is an acute inflammatory affection, characterised by the development of groups of vesicles on a patch of inflamed skin or mucous membrane.

Two forms are recognised, which, although similar in their anatomical characters, differ as regards their clinical phenomena and pathological relations.

I. *Herpes Catarrhalis* frequently follows a rigor, and may be its sole sequela. In children a pyrexia of two or three days' duration and of considerable intensity (103° – 104° F.) may rapidly subside on the appearance of a crop of herpes. "Herpetic fever" is sometimes a prominent feature of "catheter fever," and often accompanies the onset or crisis of acute febrile diseases, especially pneumonia, pleurisy, bronchitis, ague and enteric fever. It is commonest in spring and autumn, and may affect so many persons simultaneously as almost to merit the epithet epidemic. The lesions do not exhibit the "nerve distribution" and unilateral distribution of those of zoster. It is accompanied by little or no pain, seldom leaves scars, and is very prone to recur.

Herpes facialis is the commonest form. It occurs in order of frequency upon the lips, *alae nasi*, ears, chin, and cheeks, and often spreads to the mucous membrane of the cheek; more rarely the tongue, soft palate, uvula and tonsils are attacked, especially in connection with digestive derangements ("dyspeptic ulcers"). The vesicles on the skin are small, contain clear or turbid fluid, do not rupture unless interfered with, cause no subjective symptoms except slight burning sensations, and usually dry up, with the formation of yellowish crusts, in about a week. On the mucous membranes, however, minute excoriations result from the maceration of the epidermic covering of the vesicles by the saliva, and may lead to a mistaken diagnosis of aphthæ, diphtheria, or even syphilis.

Herpes progenitalis is common in the male sex, affecting chiefly the prepuce and glans penis, but is rare in the female sex, with the notable exception of "*puellæ publicæ*," in whom it is common, and situated generally upon the *labia majora* and *minora*. In both sexes antecedent syphilis or gonorrhœa predisposes to its occurrence; it is very liable to recur, and in some individuals every act of coitus is followed by an outbreak. It seldom occurs in persons above forty years of age. The vesicles are rarely numerous, and, if left alone,

heal in a few days; but they are often scratched, when the resulting excoriations may discharge freely, and the diagnosis from chancroids may become extremely difficult. Sometimes severe neuralgic pain is present, allying the disease with zoster.

Treatment.—Dusting powders or soothing ointments are usually all that is required, but lead lotions may be used if there be much burning or pain.

II. *Herpes Zoster* (*Zoster*, *Zona*, *Shingles*) is the result of neuritis, most commonly of the intercostal and lumbar nerves, and follows their peripheral distribution.

The two upper divisions of the fifth nerve are also frequently affected, when the cutaneous manifestations may be accompanied by conjunctivitis, keratitis, iritis, or even papillitis. It may, however, follow the course of any cutaneous nerve, various names being attached to it indicative of the nerve or region affected. The nerves most frequently involved are the sciatic, anterior crural, ilio-inguinal, musculo-spiral, occipitals and the branches of the superficial cervical plexus. It is almost invariably unilateral, and, if bilateral, the same nerve is never affected on the two sides. A symmetrical herpetiform rash affecting the distribution of both fifth nerves has, however, been observed in some syphilitic cases. Recurrences are said to be very exceptional, but the writer's experience does not support the statement.

The appearance of the rash is generally preceded by severe neuralgic pain, lasting twenty-four hours or more, and frequently by considerable febrile disturbance or malaise. Then patches of skin inflame, and closely packed clusters of small papules, which rapidly become vesicles containing clear fluid, form upon them. At the end of four or five days the climax of the disease is usually attained, but successive crops may sometimes appear afterwards. The fully developed vesicles are often about the size of a pea, and may coalesce to form large, shallow blebs, the contents of which may be serous, purulent, or hæmorrhagic. At the periphery of the patches the lesions frequently abort—*i.e.*, are arrested in an intermediate stage of their development. The eruption after attaining its maximum quickly subsides, yellow scabs being formed, the separation of which often leaves deep, indelible scars. The process is generally complete at the end of three weeks, but sometimes, owing to extrinsic

circumstances, the lesions become gangrenous, and healing is protracted.

Pain is a prominent feature of the disease, except in children; it may precede, accompany, or succeed the rash, and bears no proportion to its amount; in old persons it is often of excruciating intensity, and may persist for months after apparent recovery. There may be anæsthesia or numbness of the skin, even where subjective pain is complained of (anæsthesia dolorosa). Persistent pruritus, motor paralysis, and atrophy of skin or subjacent muscle are rarer sequelæ.

The *diagnosis* is easy as a rule, but difficulties may arise from the eruption being abortive or becoming irritated by rubbing, scratching, or unsuitable applications. It may be mistaken for pleurodynia or pleurisy at first, afterwards for vesicular or pustular syphiloderma, eczema, hydroa, or pemphigus.

Pathology.—Inflammatory changes have been demonstrated in the spinal ganglia and peripheral nerves. Vesication results from the rapid and copious exudation of serum and leucocytes into the loose rete mucosum, raising the epidermic layers; scars are the consequence of the destruction of the papillary layers.

The *ætiology* of most cases is obscure; cold, damp, and malaria are responsible for a certain number, and small epidemics often occur in spring and autumn. Injuries to, pressure upon, and various diseases of, the nerve trunks and centres may cause herpes in certain persons, and it is believed by some, and probably with reason, to occur with special frequency during the administration of arsenic.

Treatment.—The part must be protected from friction and irritation by dusting powders (zinc or bismuth oleate, starch, &c.), and cotton wool. If pain be severe, morphia and collodion is a useful application. Tonics must be given, especially quinine, iron, and cod-liver oil. Phosphide of zinc ($\frac{1}{3}$ grain every three hours) is said to shorten the disease. For persistent pain camphor-chloral, belladonna liniment, and galvanism have been warmly recommended, but morphia used hypodermically is the most reliable drug, and one injection occasionally gives permanent relief. The diet ought to be generous, and, in the case of old persons, may include good wine.

J. J. PRINGLE.

HICCOUGH (Hiccup; Singultus) is a sudden contraction of the diaphragm,

unaccompanied by the normal simultaneous opening of the glottis.

Hiccough is a reflex act, but the term is commonly applied to the characteristic noise due to the inrush of air through the narrowed glottic opening, which necessarily attends it, and is its most obvious feature. It is met with in many forms of nervous and gastric disorder, in uræmia, and in abdominal diseases, especially peritonitis, when it is of decidedly unfavourable omen. Even when it has no such significance it is certainly a troublesome symptom to the patient.

Treatment.—Holding the breath is a popular and frequently efficacious method of arresting it. In serious cases the stomach should be emptied by an emetic. If that be inadvisable, a subcutaneous injection of morphia may be given. When due to a nervous affection, chloroform and opium may be tried.

HYDATID DISEASE.—An hydatid tumour consists of one or more cysts enclosed in a fibrous capsule, and originating from the scolex of the tænia echinococcus, a form of tapeworm which infests some of the lower animals, and notably dogs.

The adult worm is very small, measuring about a quarter of an inch in length, and possessing only four segments, of which the terminal one is as long as the rest of the animal, and is alone provided with reproductive organs. The head presents four suckers and a double row of hooklets, varying from thirty to fifty in number. The eggs, discharged with the terminal segment, find their way into the human stomach, and, their capsules being dissolved, the embryos, armed with six hooklets, are set free, and, having made their way through the coats of the stomach, may wander to any part of the body. As they are far more often met with in the liver than elsewhere it may be presumed that they get into one of the branches of the portal vein.

Arrived at its destination, the embryo loses its hooklets, increases in size, and becomes converted into a transparent vesicle. The next change is that a granular layer forms around it which is converted into fibrous tissue, ultimately constituting its capsule. Inside this the cyst-wall proper consists of two parts, an outer thick homogeneous laminated elastic membrane, and an inner granular layer. From this inner layer there protrude inwards many little bud-like cysts, which for a time remain

connected to it by a pedicle, but are ultimately set free, and are then known as daughter cysts. Inside these by a similar process other cysts may form (grand-daughter cysts). When the pedicles do not disappear, and the buds remain permanently attached to the inner layer, they are known as brood capsules, because they contain the scolices, of which there may be ten or a dozen in each little sac. The scolex is the larval form, and possesses a head exactly resembling that of the parent worm.

The fluid contained in these cysts is clear, non-albuminous, and slightly saline. On microscopical examination, some detached hooklets will often be found in it, as well as the scolices. An echinococcus cyst may not develop any scolices, in which case it is spoken of as an acephalocyst. Very rarely the cysts are multilocular—*i.e.*, divided by septa into a number of small cavities.

The *symptoms* produced by the presence of an hydatid tumour will depend upon its situation, and will be found on reference to the diseases of the viscera most commonly affected (*vide* LIVER, HYDATID OF; ABDOMINAL TUMOURS, DIAGNOSIS OF).

JOHN ABERCROMBIE.

HYDROA.—This term includes a group of vesicular and bullous skin affections presenting many points of affinity with the vesicating erythemata on the one hand, with herpes and pemphigus on the other, but with characteristics of its own sufficiently marked to justify separate description. The group includes the diseases described as dermatitis herpetiformis, pemphigus pruriginosus, urticaria vesicans and herpes gestationis, and is by no means so uncommon as is generally supposed.

Hydroa occurs in persons of either sex, especially those of neurotic temperament, and often after worry or anxiety; frequently it shows itself during pregnancy or in the parturient state. Its course is intermittent and chronic, lasting for months or even years with periodical intermissions or exacerbations, but with a decided tendency towards ultimate recovery.

Symptoms.—Shivering, pyrexia, and malaise may precede its outbreak, and violent itching is almost invariable; then erythematous patches and raised papules or plateaux, often circinate and rapidly vesicating, appear in successive crops on the trunk and limbs, but the face, neck, scalp, and buccal mucous membrane may

also be affected. The vesicles, when recent, are small, pin-head sized, often angular, tense or umbilicated, contain clear or turbid yellowish fluid, and frequently exhibit herpetiform grouping. By their fusion large bullae may be formed, and these may or may not be surrounded by an inflammatory halo. These various types of lesion usually co-exist, giving the disease its markedly polymorphic character.

Itching is almost always severe throughout, and pain or burning is often also complained of. The formation of scales and crusts evidences the beginning of subsidence of the eruption, which is followed by deep pigmentation, with or without scarring.

The *diagnosis* is often difficult at first; the disease may be mistaken for variola, pustular syphiloderma, or bullous iodide rash; afterwards it must be differentiated from its afore-mentioned congeners.

Treatment is sometimes decidedly beneficial. Arsenic, pushed to the limit of the patient's tolerance, is the drug most generally useful. At other times belladonna, atropine, and quinine appear to be valuable, while cod-liver oil is of marked benefit to debilitated persons. Locally, lotions of liquor carbonis detergens (3ij ad ʒviii) or of thymol or naphthol (2 to 5 per cent.) are useful in allaying itching, but prolonged tepid bathing may sometimes be necessary to obtain a good night's rest.

J. J. PRINGLE.

HYDROCEPHALUS.—An accumulation or excess of fluid either within the cerebral ventricles (internal) or outside the brain substance (external). Analogous conditions occur about the spinal cord.

Symptoms.—The head grows large and becomes globular; the circumference of the head may be enormously increased, and may measure 30 inches; the rate of growth varies, and sometimes the head remains stationary in size for weeks together. The sclerotic is often exposed above the cornea, chiefly because of the altered plane of the orbital plates, their direction being much more vertical than natural. The unossified sutures readily yield before the hydrostatic pressure, and the bones become very thin, either generally or in limited areas (craniotabes, *q.v.*); in the sutures and fontanelles Wormian bones may develop. The sagittal suture and anterior fontanelle are normally later than other parts in closing, and those parts present most widening

and are the last to close in hydrocephalus.

The eyeballs are rendered more prominent and depressed, so that the pupils may be partly covered by the lower lids. A vibratile thrill or fluctuation may be detected. The hair often grows thinly; the skin of the head may be tense and shiny; large veins may cause furrows (simulating sutures) in the skull bones; the face looks abnormally small by contrast with the big cranium. The mental, motor, vaso-motor and trophic functions are very often deranged. Convulsions are not uncommon; the spasms may occur in any part of the body; they may partake of the characters of true epilepsy; twitchings sometimes like chorea may be seen. The muscles are always weaker than natural; their mechanical and faradic irritability is almost always increased. The knee jerks are usually exaggerated, and ankle clonus may be obtained; the superficial reflexes are sometimes increased, sometimes more marked on one side of the body. Sometimes there is great emaciation, and at others remarkable fattening (lipomatosis neurotica). Acromegaly has been noted in at least one case, and in one case myxedema may have been present, and the thyroid was atrophied.

The mental development is often retarded, though it is striking how intelligent many of these children seem. If hydrocephalus develop after closure of the cranial sutures, mental apathy and other obscure signs may occur, leading to a diagnosis of "tabes nervosa" or "neurasthenia." Probably any motor symptom and any mental symptom may occur in these cases; strabismus, nystagmus, amblyopia, contractures, laryngismus stridulus, and various paralyses have been observed. The optic nerves may be atrophied and white from pressure on the optic chiasma by the distended third ventricle.

The course is not usually favourable; most cases die within a few years, generally as the result of convulsions or intercurrent inflammation of the lungs or throat (diphtheria). There is nothing in the nature of the affection which should kill, bearing in mind that the brain tissues are singularly tolerant of slowly increasing pressure. Trousseau recorded a case which lived for seventy-eight years.

Diagnosis.—An encephalocele differs from hydrocephalus in being local and more opaque, and in having a doughy, clastic consistence. A fungus of the

dura mater projecting through a bone is also local and feels doughy. Macrocephalus or large head may be due to rickets or syphilis, and perhaps to a "hypertrophy" (probably false) of the brain. In the two former diseases the enlargement is chiefly due to bony overgrowth.

Pathology.—Probably most cases of chronic hydrocephalus are due to the interference with the circulation of cerebro-spinal fluid between the sub-arachnoid spaces and the cerebral ventricles, and probably also the most frequent cause of this interference is occlusion of the foramen of Magendie (see MENINGITIS, POSTERIOR); which is generally the effect of a local meningitis. Hydrocephalus arises also in cases of intracranial tumour, and the mechanism may be the same in all cases. That congenital syphilis may determine a *posterior meningitis* with subsequent hydrocephalus is certain. That rickets alone is capable of producing hydrocephalus is very doubtful.

Pressure on the venæ Galeni, impediments to the escape of blood by the veins and intracranial sinuses, excessive secretion or diminished absorption from the lining membranes of the brain are each quoted as effective in the production of hydrocephalus.

Anatomy.—The ventricles are distended with a serous fluid, which may be quite clear, turbid, or may contain flakes of lymph, and is in some cases purulent. All the soft parts of the brain are stretched and thinned, and the commissures and septum lucidum are generally torn and macerated (white softening). The sulci tend to be obliterated, and the convolutions to be flattened. The membranes may be thinned, but are often thickened, and they may present a "shagreen" appearance, granules, looking like fine white sand, studding their surface over a varying extent. These granules are composed of small round cells; they appear to be buds composed of granulation tissue (see *Path. Trans.* 1889—case by the writer of meningitis, arteritis, sclerosis and atrophy of the brain from congenital syphilis). It is possible that these buds are immature morbid choroid plexuses. The mode of origin of the choroid plexuses has not yet been clearly explained.

Ætiology.—Acute hydrocephalus internus occurs in tubercular and other forms of meningitis. External hydrocephalus is met with in cases of local atrophy of the brain; it is not usual to

describe as external hydrocephalus a general excess of fluid in the sub-arachnoid tissues of the brain such as goes with general cerebral atrophy. External hydrocephalus may accompany any sort of local brain atrophy, whether it be porencephalia—congenital hole in the brain—or the result of hæmorrhages, embolism, or thrombosis. Speaking generally, by hydrocephalus is meant a chronic dropsy of the cerebral ventricles, dating from birth or early infancy (congenital or infantile).

Treatment.—Great care is required to prevent the occurrence of accidents, as blows and falls are more apt to develop neuroses than when the brain is healthy. Counter-irritation and internal remedies scarcely ever cause any reduction in the quantity of fluid or affect the size of the head. Uniform pressure by strips of plaster or by bandaging, so as to make methodical compression, has very seldom done any good. Paracentesis is scarcely less hopeful, though in a few cases the head has been lessened in size; if the operation be undertaken, the fluid must be very slowly withdrawn, and even then convulsions may arise. The first spot to puncture is about an inch from the anterior fontanelle near the edge of the coronal suture, so as to avoid the longitudinal sinus and entering veins; only a few ounces of fluid should be withdrawn at one time; the difficulty as a rule is to get much fluid to flow through the fine cannula.

In syphilitic infants the inunction of blue ointment into the shorn scalp has removed the hydrocephalus in three of the writer's cases.

ANGEL MONEY.

HYDROMETRA means retention of watery fluid in the uterine cavity from blocking of the cervical canal.

It has been found on post-mortem examination as a result of congenital atresia in young infants; but it most commonly occurs in women who have ceased to menstruate. It is a result of endometritis, which is either combined with cicatricial closure of the cervical canal, or the canal is blocked by a tumour, or there is flexion of the uterus, flattening the canal at the point of flexion, and so closing it; the atrophied senile uterus being thin and deficient in contractile power. The condition is preceded by leucorrhœa, and sometimes the distension of the uterus is accompanied by pain, but it rarely causes troublesome symptoms, and may be only discovered

in post-mortem examination. It may lead to regurgitation of fluid into the tubes and their distension, *i.e.*, hydrosalpinx.

The *treatment* of hydrometra is simply to reopen the canal and let out the fluid. The opening should then be kept patent with a stem until its margins have healed. In cases of hydrometra due to flexion, the mere passage of a sound or a bougie is often sufficient.

G. E. HERMAN.

HYDROPHOBIA (RABIES).—It is unfortunate that the term "hydrophobia" has been generally adopted as the name of this disease in preference to "rabies," as a fear of water, although a prominent symptom of the disease in man, is absent in the lower animals.

Rabies is an acute disease due to the presence of a specific virus which is conveyed by inoculation from animal to animal (all being susceptible to its effects) by subcutaneous or submucous infection through a wound.

Virus.—This, though it has never been isolated in a pure state, behaves so exactly like an organism that there can be no doubt that it is one.

The virus is found almost exclusively in the nervous system, especially in the medulla and spinal cord. It is also contained (evidently in the process of excretion) in the secretion of certain glands, notably the salivary glands. It has been stated to occur in milk, but this has never been proved.

After the virus has been introduced into the system the period which elapses before the appearance of the symptoms depends upon the following factors:—

(a) *Age.*—The incubation is shorter in children than in adults. For obvious reasons the former are more frequently attacked.

(b) *Part Infected.*—The rapidity of onset of the symptoms is greatly determined by the part of the body which may happen to have been bitten.

Wounds about the face and head are especially dangerous; next in order of decreasing mortality come bites on the hands, then injuries to other parts. This relative order is no doubt greatly dependent upon the fact that the face, head and hands are usually naked, while the other parts are clothed; but bites about the head and face are under all circumstances the most dangerous.

(c) *The Extent and Severity of the Wound.*—Punctured wounds are the most dangerous, and lacerations are fatal in proportion to the extent of the surface afforded for absorption of the virus.

(d) *The Animal conveying the Infection.*—In order of decreasing severity come: (1) Wolf, (2) cat, (3) dog, (4) other animals.

The death rate among those bitten by wolves appears to be about 40 per cent.; among those bitten by dogs it is about 15 per cent. It is probable that the carnivora, by reason of their general habits and natural ferocity, are only more virulent in that they cause more severe wounds; but it is questionable whether this completely explains why the cat is so notably more dangerous than the dog.

The shortest possible incubation period has been determined by M. Pasteur's discoveries to be about seven days; this occurs most usually after subdural inoculation, *i.e.*, inoculation beneath the dura mater. The minimum period has, however, been clinically observed in children, but such cases are very rare. It occurs frequently in rodents after subdural inoculation, the virus having been perfected by transmission through several generations of such animals. The usual period of incubation after subdural inoculation is from fourteen to twenty-one days, and this period has often been observed clinically. The commonest incubation period in man, after subcutaneous infection by a bite or a scratch, is from six to eight weeks. The maximum is unfortunately undetermined, although there appear good grounds for believing that in very exceptional circumstances it may be as long as two years. Many of the cases in which the disease is stated to have lain dormant for longer periods have not been substantiated on complete investigation.

SYMPTOMS.—These for description are best grouped in three classes, corresponding with the stages of the disease:—(a) Premonitory; (b) Furious, or hyper-excitable; (c) Paralytic. Animals differ in the extent to which they exhibit each or all of the above classes of symptoms, but, if any case be carefully examined, each group is observable, though varying in degree and time.

(a) *Premonitory.*—The symptoms, especially in man, are hallucinations, a vague sense of fear and malaise, and frequently itching or irritation in the cicatrix. This may be excessive, and may amount to pain.

In this stage a man (or dog) behaves oddly and suspiciously. The appetite in the dog becomes depraved, and by the time the second stage is reached solid food is refused altogether. This symptom, although absent in man, is pathognomonic of the disease in the lower animals. The temperature begins to rise, the pulse and

respirations are accelerated, the voice becomes husky, and the bark and howl of the lower animal is characteristic.

	Stages.			Death by—
	Premonitory.	Furious.	Paralytic.	
Birds	...	well marked	well marked	syncope
Rodents	rare	rare	do.	coma
Ungulates and Ruminants	well marked	well marked	moderate	syncope
Carnivora	do.	do.	moderate*	syncope and coma
Apes and Man	do.	do.	rare	syncope

* The paralytic form is occasionally paramount in the carnivora, and the affection is then termed paralytic or dumb rabies.

Furious.—This stage begins with restlessness, causing the lower animal to break bounds and wander. Then follows hyperæsthesia, particularly noticeable in the ungulates and in man. Any afferent stimulus—*i.e.*, a sound, a draught of air, or the mere association of a verbal suggestion—will cause a violent reflex spasm. In man this symptom constitutes the most distressing feature of the malady. The spasms, which affect particularly the muscles of the pharynx and mouth, are exceedingly painful, and are accompanied by an intense sense of dyspnoea, even when the glottis is widely open or tracheotomy has been performed.

The spasm is usually brought on by the attempt to drink, and is then seen to consist in a violent elevation of the larynx and hyoid bone. The terror of re-exciting this painful spasm leads naturally to a dread of water, which has given the name to the disease in man.

Hydrophobia is, however, as already stated, a most regrettable term, and its use is to be deprecated since it encourages the popular delusion that so long as a dog drinks, or attempts to drink, it cannot be rabid, whereas it will gladly try to do so even in the last or paralytic stage.

The temperature in the "furious" stage reaches its maximum (in some cases 103°). During the paroxysms the pulse and respirations become quickened and irregular.

Paralytic.—Before the furious stage has ceased motor paralysis sets in, almost invariably attacking first the hind

limbs and ascending to the head, in a manner so exactly similar to that of "Landry's ascending paralysis" as to suggest that that disease may be only the completely paralytic form of rabies in man. As will be seen in the foregoing table, motor paralysis is the rule in rodents, and occurs occasionally in dogs, in which animals the condition of "dumb rabies" begins as a glosso-maxillary-laryngeal paralysis, and later attacks the hind limbs. In other animals it usually forms the final stage, and follows the furious condition.

As the paralysis spreads the temperature begins to decline and becomes subnormal, falling in the rabbit sometimes as low as 22° C. The respirations become slower and the pulse gradually weaker.

In this connection it is necessary to speak of the mode of death, which, owing to the frequently marked degree of impairment of the medulla, often occurs in man and the larger animals by sudden syncope. When the motor paralysis is a very early and prominent feature—*e.g.*, in rodents—death usually takes place by gradually increasing coma (*vide* Table, *supra*).

MORBID ANATOMY.—The morbid anatomy of rabies is very simple. Owing to the fact that the virus produces functional changes of great severity, but of short duration, if the animal dies or is killed in an early stage, but few lesions are found after death. As a rule, if the disease runs its full course, the post-mortem appearances are quite characteristic. The lesions are confined almost entirely to the central nervous system, the alimentary canal and the respiratory tract; the serous membranes remaining perfectly healthy; rigor mortis is well marked.

Nervous System.—The whole of the central nervous system is usually the seat of acute though moderate inflammation; sometimes, however, only patches here and there show any changes. The vessels are greatly congested, and, consequent upon the congestion, exudation of leucocytes takes place into the peri-vascular lymphatics; hæmorrhages also occur, but these may obviously be, in part, accounted for by the mode of death.

Alimentary Canal.—According as the disease has run a furious or paralytic course, the pharynx will be more or less congested, and either covered with sticky mucus or dry. The gullet is usually normal, but the stomach is, as a rule, markedly congested. In some animals—*e.g.*, rodents—hæmorrhages are almost constantly present in the mucous mem-

brane of this viscus. In any case the fluid contents of the stomach are usually coffee-ground in appearance, from the presence of altered blood. Owing to the depravity of the appetite at the onset of the disease, the stomach in the lower animals very frequently contains foreign bodies—*e.g.*, hay, pieces of wood, stone, &c.; but the presence or absence of these things is not alone pathognomonic. To the loss of appetite is due the fact that the rest of the alimentary canal is usually empty.

Respiratory System.—The larynx frequently participates in the congestion of the pharynx. The trachea and bronchi are often markedly congested. The lungs usually show some patches of acute broncho-pneumonia with hæmorrhages. More usually the lower lobes are collapsed and œdematous.

Circulatory System.—The heart is always normal; the blood is frequently to a large extent fluid, but contains dark-coloured post-mortem clots.

In the liver, spleen and kidneys, changes similar to those seen in the central nervous system have been described, but only rarely, and subdural inoculation from these viscera has produced no effect, thus showing that they contain practically none of the virus.

Finally, the bladder is distended, especially in the paralytic stage.

In cases where the macroscopic evidence and clinical history are alike doubtful, subdural inoculation affords a ready and certain test of the existence or absence of the disease.

TREATMENT.—This terrible disease can, and should, be prevented from existing in any given country where the following measures are possible:—(1) Proper muzzling of all dogs; (2) humane destruction of all ownerless dogs; (3) proper quarantine or other measure against the importation of the malady.

Where such regulations have been in force the disease has been completely eradicated in a few years.

If, unfortunately, owing to the supineness of the authorities, it be endemic, as in this country, treatment falls under the two heads of—(a) Treatment preventive of the evil effects of the bite; (b) Treatment directed towards the palliation of the painful symptoms when they have appeared.

(a) **Preventive Treatment.**—No preventive treatment is known to be successful except that devised by M. Pasteur. This consists in the subcutaneous injection on successive days of several cubic centi-

metres of an emulsion of the dried spinal cord of rabbits that have died from the most acute form of rabies.

In Pasteur's treatment chemical substances produced during the culture of an organism, and known to be inhibitory to its growth, are introduced into the system.

This treatment is unattended by danger or untoward results—*e.g.*, the production of abscess—and its adoption has reduced the mortality among those bitten by indubitably rabid dogs from 15 per cent. to 1.3 per cent. The value of this discovery cannot therefore be over-estimated.

(b) *Palliative Treatment.*—As soon as the first symptoms have declared themselves, the aim of palliative treatment should be—(1) to diminish as far as possible the production of reflex spasm or excitement; and (2) to sustain the strength of the patient.

(1) The patient must be placed in a darkened room, kept quiet and warm; all draughts must be excluded. He must be brought thoroughly under the influence of morphine, or rectal injections of bromide of potassium and chloral may be given, but, owing to the risk of inducing syncope, chloral is a dangerous drug to employ. The sensitiveness of the pharynx may be conveniently reduced by the local application of a 20 per cent. solution of cocaine. None of the vaunted specifics—*e.g.*, the hot-air bath and curare—are of the slightest service. The employment of any but powerfully narcotic drugs is as useless as it is cruel.

(2) Nourishment must be given to the patient by means of nutrient enemata and suppositories, to avoid the spasm in the throat caused by attempts to swallow. At the beginning of the paralytic stage the patient can often swallow a little fluid with great relief, and consequently an apparent improvement is thus obtained unhappily only of a temporary kind.

HYSTERICAL OR PSEUDO-HYDROPHOBIA.—Cases from time to time occur in which neurotic persons bitten by dogs, whether rabid or not, develop symptoms resembling rabies in some particulars, and such are often recorded as marvellous cures of the real disease by drugs. A differential diagnosis may be arrived at by observing the following salient points:—

Furious Stage.—In this stage the hysterical patient usually barks like a dog, and attempts to bite everybody, even himself. He can always be deceived by suggestion, and will thus at one moment

display reflex excitement and the absence of it the next, although the stimulus be adequate in each case. The patient speaks very much about the animal by which he was attacked, whilst in genuine cases this is very rare. The state of the temperature is the most valuable test, as hysterical hydrophobia is an apyrexial affection. The pulse and respiration show no marked quickening. Finally, the absence of true mental disturbance, the stationary character of the general symptoms and the concurrence of hemi-anæsthesia or other hysteroid symptoms all help to make the diagnosis of spurious rabies obvious.

Treatment.—The confidence of the patient should be gained, and then, by suggestion and moral suasion, a cure can easily be effected.

VICTOR HORSLEY.

HYDRONEPHROSIS.—A distension of the kidney by accumulated fluid, accompanied by atrophy of its substance, the result of some obstruction in the lower urinary passages.

Symptoms.—A hydronephrosis of moderate size causes a tumour to appear in the region of the kidney, which has the usual characters of a renal tumour, detailed elsewhere (*see KIDNEY, TUMOURS OF*). The special characters are its softness, the presence of well-marked fluctuation evidencing its cystic nature, occasionally slight mobility, sometimes a lobulated outline, and generally the absence of pain or tenderness. When both kidneys are affected, a tumour may appear on both sides of the abdomen, but is then rarely of large size. In some cases the tumour disappears, or diminishes in size, coincidentally with a sudden discharge of urine. This, when present, is a most important diagnostic sign. Further, such an occurrence may take place again and again, constituting an "intermittent" hydronephrosis. Pressure upon neighbouring organs by a very large cyst sometimes causes the only symptoms complained of by the patient. Obstruction of the intestines may thereby be produced. If one kidney only be attacked, and the hydronephrosis be too small to cause any intumescence in the abdomen, no symptoms or signs may be observed which can be directly connected with it.

Diagnosis.—The signs of a renal tumour sufficiently indicate how a hydronephrosis is to be distinguished from cysts arising in other parts. Fluctuation and the absence of hæmaturia and

pain differentiate it from malignant and other solid tumours of the kidney. Pus in the urine, at one time or other, with rigors and pyrexia, characterize a pyonephrosis, but hydronephrosis may pass into this condition. A history of symptoms of renal colic produced by gravel or the presence of some other cause of obstruction to the urinary passages, serve to distinguish hydronephrosis from other cysts of the kidney. The discharge of hydatid vesicles in the urine demonstrates the nature of a cyst of parasitic origin. A perinephritic abscess is more diffused than a hydronephrosis, it is not movable, is accompanied by pyrexia and redness of the skin, and is painful and tender. Finally, the intermittent appearance of a hydronephrosis, when this occurs, is a conclusive test of its character.

Pathology and Morbid Anatomy.—The cause of hydronephrosis is always an obstruction of the urinary passages. The obstruction may be actually in the passages themselves, such as a calculus blocking the ureter; it may be a contraction of the ureter from the cicatrization of an ulcer formed during the previous passage of a calculus along the tube; it may result from a growth of tubercle in the mucous membrane of the ureter; or, again, it may be due to pressure on the ureter by tumours of different organs, peritoneal bands, or inflammatory exudation following injury.

Congenital deformities are sometimes causes of hydronephrosis. Amongst these are to be mentioned absence of the ureter, imperforate ureter or urethra, contraction or twisting of the ureter, compression of the ureter by an abnormal artery, folds in the mucous membrane of the ureter, and the entrance of the ureter into the pelvis of the kidney by an oblique opening which closes in a valve-like manner. The movement downwards of a floating kidney may so fold the ureter as to obstruct the flow of urine along the tube, and consequently produce a hydronephrosis.

It has been suggested that frequent micturition, from whatever conditions arising, may cause hydronephrosis, by the compression which the contracting bladder exerts upon the ureters. Congenital hydronephrosis is often accompanied by other congenital deformities.

When obstruction to the free passage of urine from the kidney is established, the secretion accumulates in the pelvis of the kidney. First the pelvis, then the infundibula, becomes distended, and

this, provided that no inflammation of the pelvis be set up, constitutes the first stage of hydronephrosis. It has been found, experimentally, that there is at first congestion of the kidney, due to pressure on the veins contained in the pyramidal portion, and that this gives way shortly to anæmia from pressure on the arteries. The papillæ which project into the pelvis become compressed on all sides and soon atrophy; they have even been known to become necrotic, and to be thrown off *en masse* into the pelvis. The increasing pressure of retained urine soon causes atrophy of the whole of the pyramidal portion of the kidney. The cortical portion becomes indurated from an overgrowth of fibrous tissue, and finally, in extreme cases, undergoes pressure-atrophy, and, gradually wasting, may eventually disappear. Yet the fœtal lobulation of the kidney is often somewhat evidenced in the diseased structure. Shadowings of the lobulation are seen on the surface; in the interior, fibrous septa, running inwards from the periphery divide the cavity into several loculi, which communicate only through the pelvis.

Such a condition is a fully developed hydronephrosis, a loculated sac, having fibrous walls, in which islets of kidney substance are often imbedded and filled with a watery fluid containing urinary ingredients. But the type is subject to variations. There may be no loculi, but only a single cavity, or the loculi may be few and imperfect.

If the obstruction be situated in one ureter, only the corresponding kidney will be subject to hydronephrosis. But both ureters may be separately blocked, or they may both be involved at their terminations in one cancerous tumour, and then both kidneys become hydronephrotic. Moreover, not infrequently a kidney has two ureters and two pelves; one only of these may be blocked, and consequently only that portion of the kidney corresponding to the obstructed ureter becomes distended, the remaining portion carrying on its functions as before.

The size of the hydronephrotic sac is variable; it may be enormous, or, on the other hand, smaller than a normal kidney.

In the early stages the contents of a hydronephrotic sac are ordinary urine. But soon actual secretion becomes abolished, and the fluid is simply a transudation from the blood. It is then more watery than normal urine, but con-

tains urinary salts and extractive matters, together with a little albumen, cholesterol, fat, blood, epithelial elements, and small quantities of inflammatory products. Cases are recorded in which the cyst contained colloid material.

When hydronephrosis is unilateral, the opposite kidney becomes hypertrophied, and for a long period may satisfactorily supply the needs of the body. The heart becomes hypertrophied, especially in its left ventricular portion. Even when both kidneys are disabled it is sometimes remarkable how much atrophy of both organs may take place before life is destroyed. It must be noted that in most cases the obstruction which causes distension of the kidney is not total, or at least is so only for limited and broken periods. When total obstruction has taken place the pressure in the kidney will soon rise so high as to stop secretion and transudation, and therefore simple atrophy of the kidney is most likely to be the final result.

Results.—The distension may overcome the obstacle and may not recur, the kidney being left in a more or less disabled condition, according to the length of time the obstruction has existed. Pressure upon surrounding parts in time causes exhaustion, or occasionally more rapid death from intestinal obstruction. Rupture into the peritoneum is rare, but when it occurs is usually fatal. A double hydronephrosis eventually kills by the supervention of uræmia.

Occasionally the cyst suppurates, then producing a pyonephrosis. It must also be remembered that with one kidney disabled by hydronephrosis the impaction of a calculus or any other obstruction in the opposite ureter will cause fatal suppression of urine.

Prognosis.—The prognosis is always grave, but not so serious as in other renal tumours. If both kidneys are affected the prognosis is more serious than when one only is diseased. Yet life may be prolonged for a considerable period if the obstruction be incomplete.

Treatment.—The obstruction has been overcome by shampooing the swelling. When there is great distension this is inadmissible. If distress be experienced and serious mischief is threatened from pressure or rupture, the sac should be tapped. The best situation for the puncture, as determined by Mr. Henry Morris, is just anterior to the last intercostal space, if the tumour be on the left side, or halfway between the last rib and the crest of the ilium, from 2 inches to 2½

inches behind the anterior superior spine of the ilium, if the tumour be on the right side.

Incision is required if the cyst suppurate, or if, after aspiration, the cyst repeatedly refill and dangerous symptoms again arise. The incision is to be made in the lumbar region, and the cyst drained and irrigated antiseptically. Nephrectomy is a last resource when the useless remains of a kidney are causing exhausting suppuration. Rupture of the cyst into the peritoneum has been successfully treated by laparotomy and drainage.

ROBERT MAGUIRE.

HYDRORRHŒA GRAVIDARUM is a rare and curious disease, characterized by a discharge of watery fluid from the uterus during pregnancy.

Different opinions have been held as to the origin of the fluid.

(1) It is sometimes a discharge of fluid pent up between the decidua vera and reflexa, the fluid being produced by hypertrophied decidual glands; the disease, according to this view, being properly styled, "*endometritis deciduæ catarrhalis*." (2) It is believed to be due to rupture of the membranes high above the os uteri, and partial discharge of the liquor amnii. (3) It may arise from an excessive secretion by the glands of the cervix, analogous to the excessive salivation which sometimes occurs in pregnancy.

None of these theories are proved, though, in support of each, cases have been reported in which the facts rendered the explanation plausible.

As we have no accurate knowledge of the nature of the disease, no effective treatment can be described.

G. E. HERMAN.

HYPERTROPHY.—It is a matter of almost daily observation that the increased use of a part tends to enlarge and strengthen it; when enlargement from this cause is excessive, or results from some unusual condition of the corresponding or correlated organ, it is termed hypertrophy.

Parts are often described as hypertrophied when enlarged from other causes; it is desirable that the various kinds of enlargement be sharply separated from each other. The heart furnishes us with some typical forms.

At birth, the walls of the cardiac ventricles are of equal thickness in the human fœtus; on the establishment of pulmonary respiration, the work of the

ventricles is unequally divided, the left ventricle maintains the systemic, whereas the right ministers to the pulmonic circulation. In consequence of the greater amount of work required, the walls of the left ventricle enlarge, and are nearly three times thicker than those of the right. Such thickening is often called functional.

If at birth the ductus arteriosus should fail to obliterate, or the aorta arise in part from the two ventricles, the walls of the right ventricle will increase in size equally with the left: such enlargement is true hypertrophy.

Later in life the heart may exceed the normal size, in consequence of an accumulation of fat: such enlargement is pseudo-hypertrophy.

Functional enlargement of organs, consequent on increased use, is well illustrated by the uterus in pregnancy, the mammae in lactation, the testes of birds during the breeding season, the oviducts of fish, birds, frogs, and turtles, the muscles of the arms in boatmen and smiths, and the leg muscles in gymnasts.

As examples of hypertrophy, the following may be selected:—The thickening of the muscular coats of the urinary bladder in stricture of the urethra, vesical calculus, and, occasionally, in prostatic enlargement, but especially when an adenoma of the prostate produces valvular obstruction of the urethra; the muscular coats of the gall-bladder in old-standing cases of biliary calculi; the muscular tissue in the trachea and larger bronchi in individuals with chronic bronchitis; the walls of the small intestines above congenital stricture of the ileum, due to abnormal coalescence of the vitello-intestinal duct; and the walls of the œsophagus above a fibrous stricture. The muscular tissue in varicose veins becomes increased in quantity, due to the extra work required in supporting an abnormal quantity of blood. This condition may be most advantageously studied in varicose saphena veins, and in the pampiniform plexuses of young adults.

This marked tendency of plain muscle-fibre to hypertrophy may be turned to advantage in the operation of excision of the anus, for if only a small portion of the external sphincter be preserved, it will rapidly enlarge, and in a few months form an efficient valve, giving the individual absolute control over the outlet of the bowel.

The effects and advantages of increase in size and strength from excessive use

are well shown in the extra development of an arm or leg after its fellow has been amputated, especially in young and vigorous subjects. After amputation of the hallux at the tarso-metatarsal joint, the second toe will enlarge if the foot be used for walking, until it nearly rivals in size and appearance the lost toe. Probably all the tissues of the body respond in this way to increased use, even in the case of the testes. The museum of the Royal College of Surgeons contains a testis taken from a monorchis. Divested of the tunica vaginalis, it weighed 18 drachms and 2 scruples, was healthy in structure, and the epididymis was loaded with secretion. No testis could be detected on the opposite side. In cases of undescended testis, the retained organ is always abnormally small, whilst the descended testis is unusually heavy; this, of course, refers only to adults. The same applies to retained testis in monkeys.

The kidney furnishes some very striking examples of hypertrophy; when one kidney is slowly destroyed, its fellow, if healthy, will gradually increase until it doubles in size and weight. The secreting tissue of such kidneys is perfectly natural. Examples of single hypertrophied kidneys have been recorded often in man, in birds, sheep, oxen, and horses.

Under favourable conditions, bone will hypertrophy, although nearly all the specimens described in pathological museums as hypertrophy of bone are spurious examples of the process. Hypertrophy is occasionally exhibited by the fibula in cases of long-standing united fracture of the tibia; under such conditions, the fibula transmits the weight of the body to the ground—the increased use of the bone leads to its enlargement, thus enabling it to respond to the demand made upon it.

Hypertrophy of organs from increased use is inseparably connected with increased blood supply. The rapidity with which arteries enlarge is often quite marvellous. A study of this question in connection with the arteries supplying the growing antlers of deer was turned to practical advantage by Hunter in the treatment of aneurysm. A very similar change may be observed in the arteries of a limb when it is the seat of a sarcomatous growth. When amputation is performed at the hip-joint, in cases of large sarcomata connected with the lower end of the femur, the large size of those arteries, which in a normal limb are usually insignificant twigs, is very noticeable. In

man, the temporal arteries will hypertrophy rapidly after ligation of the common carotid artery of the opposite side, and become perceptibly larger in a few days.

It may be useful to enumerate some of the commoner forms of enlargement of organs frequently mistaken for hypertrophy, amongst which bone takes a leading position. Thickened bones in cases of osteitis deformans, mollities ossium, acromegaly, rickets and chronic periostitis or osteitis, cirrhotic and fatty livers, enlarged prostate, the brain in hydrocephalus, macroglossia, emphysematous lung, congenital enlargement of fingers, toes, or limbs, the thyroid body in goitre, inflamed testes and ovaries, and many similar conditions. Overgrown toe-nails, elongated beaks of birds, and teeth of rodents are often set forth as examples of hypertrophy; on the contrary, these owe their abnormal length to disease, not to increased use.

It has also been customary to regard the local thickenings of the skin on the hands and feet, known as callosities and corns, as examples of hypertrophy. A careful examination of the subject induces the writer to class them as thickening the result of irritation; according to this view they should be relegated to the class of pseudo-hypertrophies. That local irritation will induce thickening of a part is undeniable. The intermittent pressure of badly fitting boots will cause enlargement of the head of the first metatarsal bone; the irritation of the pre-patellar bursa, caused by frequent kneeling, as in housemaids, often leads to thickening of its walls until the cavity of the bursa becomes nearly filled with fibrous material. The callosities on the knuckles of the gorilla and over the sternum of camels are cases in point.

When the various forms of enlargement of parts are strictly analysed, we are forced to the conclusion that true hypertrophy is not very common.

In conclusion, a few remarks may be made on hypertrophy of the senses, for increased or abnormal use has a similar effect upon them as upon the tissues.

When an individual loses an eye by accident in early life, the remaining eye, if healthy, acquires a greater range of movement and quickness, which compensates in no small degree for the loss of its companion. In those born blind, or who lose the sense of vision in early life, the power of hearing becomes wonderfully acute and not rarely tactile sensibility becomes so intensified that

such persons make themselves acquainted with external surroundings in a marvellous manner.

The mole furnishes a good example of this form of hypertrophy, its auditory acuteness is proverbial. It is said that the blind fish of Kentucky are acutely sensitive to sound as well as to undulations of the water produced in various ways.

J. BLAND SUTTON.

HYPNOTISM.—A term of neutral colour introduced by James Braid, of Manchester, in 1843, to describe some symptoms, in many ways like natural sleep, which he had been able to induce in some men and animals by means, as he thought, of fixed attention.

Phenomena of the same class, and in many respects identical, had been forced on the attention of the Western world by Anthony Mesmer after he came to Paris in 1778, and had, along with some extravagances, been christened as "mesmerism" by an uncritical clique, and as "animal magnetism" by others who were not physicists. They had puzzled and interested some honest and learned *savants* and doctors in the earlier years of this century—De Puysegur, Pététin, Du Potet, Magendie, Esquirol; but an *à priori* prejudice against their reality was so strong that the French Academy of Medicine in 1833 refused to print the Report of its own commissioners upon them because in it they had admitted the truth of some of the experiments which the mesmerists had exhibited.

Dr. John Wilson in 1839 "mesmerized" elephants and wolves, and Braid, aroused by the lectures and demonstrations of Lafontaine, and starting from a position of hostile scepticism, clearly showed, to his own surprise, that not only animals, but also human beings, could be affected after this mesmeric fashion, and by the candid study of this "neurohypnology," or "hypnotism" as he afterwards called it, helped most materially to break down the popular suspicion of universal fraud in the matter, and further offered a physiological hypothesis of its causation by fixed attention.

Esdaile, a surgeon in the service of the East India Company, independently, in 1845, at Hooghly, before chloroform had been introduced into India, showed most conclusively that by hypnotism such complete anæsthesia could be produced that lithotomy, amputation above the knee, and many other major surgical operations could be performed, without the knowledge of the patients, during

hypnotic states lasting some ten or twelve hours.

The use of chloroform and ether for a time diverted attention from the anæsthetic conditions of hypnotism, and its abnormal psychical states were not seriously considered in the scientific world.

Azam and Broca pointed out their importance in 1860, and in 1866 Liébeault, of Nancy, published the results of some years of the use of hypnotism in medicine, which were for the time almost universally neglected. Charles Richet in 1875 demonstrated afresh the physiological facts, and threw new light upon them; many French physicians began to take an interest in them, and a few German physiologists. Charcot in 1878 began to make experiments which were confined to the hysterical patients in the Salpêtrière, and in 1882 Bernheim began a much wider trial of hypnotism on his patients with all varieties of disease in the large hospital of Nancy, where Liébeault's long experience had at last given his practice and beliefs great influence, and since then there has been rapid spread of experiment and knowledge through France (A. Voisin, Pitres, Grasset, Beaunis, Dumontpallier), Italy (Lombroso, Tamburini), Germany (Heidenhain, Preyer, Krafft-Ebing, Moll), Switzerland (Forel), Belgium (Delbœuf), Austria (Benedikt), Russia (Danilewsky), and Sweden (Wetterstrand); but to this the medical world of England has added very little.

A few words of retrospect have been necessary to show how scattered and probably incomplete the evidence is for any final generalizations in the very difficult problems of the psychical and physical conditions of hypnotism and its application to medicine. It would be out of place to recount the attempts at solution of these problems, mostly the results of a limited view and a desire for rapid systematization, or at least a working hypothesis. There is needed in the hypnotizers self-confidence, determination, and probably some personal quality not yet determinable; in the subject, at least to begin with, a passive acquiescence. The hypnotizable have no exact distinguishing marks; they are to be best found by trial; in greater numbers among the younger subjects and less educated classes; more frequently, probably, among the French and Italians than among the Germans and English; not to any marked extent more among women than men, among sick than healthy, or among

hysterical than non-hysterical persons, though some hysterics have been easily trained into more elaborate symptoms.

Hypnotism is occasionally induced for the first time by mere authoritative command or suggestion in those who know little or nothing about the expected state; more often by some description of the sleeping state that is to follow, accompanied either by long gazing at something fixed, best held near to, and above the level of, the eyes, so as to induce an upward convergent squint, or else by directing attention to some monotonous stimulus to eye or skin or ear, such as slow downward passes made by the operator's hands before the subject's eyes, or gentle uniform stroking of the forehead, or holding a ticking watch to the ear. Occasionally some parts of the body have been found abnormally sensitive—*e.g.*, the eyeballs or vertex—and pressure on them is followed by hypnotism (P. Richer, Dumontpallier). In all these cases the part played by expectation and suggestion cannot be eliminated or accurately estimated.

The common hypnotic physical results as seen in the healthy subject are that the eyelids close and he cannot open them, and that his eyeballs roll upwards into a position of slight characteristic convergent squint; there is generally increased excitability of muscle and peripheral nerve, with a lessening of the time of involuntary and increase of time of voluntary reflex (Stanley Hall), and some anæsthesia. Among the psychical phenomena there is a loss of spontaneity in his acts, and a ready obedience to commands, however ridiculous, and confident belief in any delusion, however absurd. The patient is, as a rule, alert and most impressionable, and in fact is ready to form the buffoon of the platform experimenter. In such a subject contraction or stiffening of a limb may be induced by light surface-friction and suggestion, and the arm, stiffened in extension, may be held out at right angles to the shoulder without tremor for even seven hours (Berger), whilst the same individual in a normal state will find it difficult to resist tremor after extension for some seven minutes, and collapse from exhaustion in a quarter of an hour. There may be also a cataleptic condition, following generally upon some shock of sound or sudden light, but in this the *flexibilitas cerea* is imperfect.

In a subject in such states as these some traces of memory often persist after awakening; a dim recollection, for ex-

ample, of feeling unable to refuse obedience to an order which was felt to be ridiculous or fancied to be impossible. His tendency, if nothing keep him alert or restore him to his normal condition, is to lapse into a deeper state, for which there is no more accurate border line than can be drawn by his complete absence of memory of what has happened in his deeper state, either on being completely wakened or on being roused so as to re-enter his previous more alert state (Gurney). But full memory of either alert or deep condition, and of that alone, recurs to him when that condition is re-induced, as in natural somnambulism the somnambulist forgets his ordinary life, but remembers his actions in previous somnambulant attacks. Throughout he is obedient to command, and so exceedingly susceptible to suggestion that he will act on it sometimes a year after he has been waked (Beaunis), though, if given when in a deeper stage, he will know nothing of this post-hypnotic suggestion until he enacts it, and then be quite unaware of the reason of his actions. In the deep state there is, as a rule, a tendency towards falling into a heavy sleep, which gradually becomes normal, and from which the subject wakes with little or no discomfort. Under some circumstances of disease, and more especially of psychical abnormality, such as hysteria, different types of conscious or unconscious suggestion from the hypnotist are very delicately appreciated by some hyperæsthetic subjects, and many variations occur. Stages of lethargy, catalepsy and somnambulism are described by Charcot as occurring in this sequence in his hysterical patients at the Salpêtrière, but are not found after the same pattern elsewhere, even in hysteria, by hypnotists who are not acquainted with them or do not expect them.

Turning to the uses of hypnotism in medical treatment, we find that they may be roughly divided into the relief of pain, the obtaining of sleep, and the large group of consequences or concomitants of the change of some functional activity or mental attitude under post-hypnotic suggestion. In such a case, for example, as that of a middle-aged man with severe double pneumonia, high fever, insomnia, and incipient delirium, hypnotism has been induced on first sight for the first time in about ten minutes by Bernheim, and, after a vigorous and repeated command to sleep, complete and refreshing sleep has followed for five hours in the middle

of the day, with very substantial benefit, and without the drawbacks generally attaching to hypnotic drugs in such a case. The relief of the most severe pain, such as that of acute articular rheumatism, locomotor ataxy, &c., has not been reached, but some sub-acute cases of articular rheumatism, and a few of chorea, obstinate sciatica, and many lesser inconveniences, have been entirely cured. After experiments on more than 8000 patients at Nancy, and many others at Toulon (Fontan, Ségard), at Montpellier (Grasset), at Bordeaux (Pitres), at Zürich (Forel), at Amsterdam (van Eeden), at Berlin (Moll), at Munich (Schrenck, Notzina), and elsewhere, the disposition is to continue and extend the treatment.

In surgical operations it has been rarely tried of late, as the administration of anæsthetics has improved and is much more universally applicable; still, there are several well-recorded recent instances of childbirth being rendered painless (Pritzl, Mesnet, Liébeault), and a few surgical operations also (Tillaux, Boursier).

The receptiveness to suggestion in the subject gives the main power to the hypnotizer, in the form of a suggestion or command to be carried out, it may be, a long time after awakening, and is thus applicable to the control of morbid impulses, such as a morphine or alcohol habit, or hysteria. A patient who is susceptible to this extent imagines his new post-hypnotic inclination to be his own self-engendered idea, and readily acts upon it. In many instances it has, after more or less frequent repetition, proved stronger than his original habit, and he has rejected with disgust what was formerly his chief pleasure.

In cases of acute and chronic insanity it has been, as a rule, difficult to gain the quiet acquiescence necessary at first, but it has been found possible, in several of the few cases where it has been tried, to overcome by patient hypnotism destructive and pernicious tendencies entirely for a time, and probably permanently, though the results are too recent to afford complete evidence (A. Voisin, Forel). The limits of the powers of post-hypnotic suggestion have not as yet been thoroughly investigated; it is possible that by hypnotism power may be put into the wrong hands, and, consequently, it is always desirable that it should be attempted only by the medical advisers or under strict medical supervision.

A. T. MYERS.

HYPOCHONDRIASIS.—The term originated in the ancient belief that the seat of the disease lay in the organs behind the xiphi-sternum and below the diaphragm. Although in the present day an abnormal cerebral condition is considered the source of the affection, the expression, nevertheless, sufficiently marks its most frequent causal relationship. It is very difficult to define with accuracy its exact limitation, for the disease is on the border-land of insanity, and many cases seem to partake of both a melancholic and hypochondriac element. In the present article the term will be restricted to cases of mental depression originating in morbid sensations.

Symptoms.—As a rule, some little derangement, probably of the digestive tract, occurs in an individual unduly anxious concerning his health. He has picked up some scraps of medical knowledge, and ascribes the symptoms to some serious disease. He now eagerly examines his tongue, pulse, urine and feces, and finds in most or all some corroboration of his fearful anticipations. Probably he consults popular medical text-books, adapts positive facts to his present condition, and unconsciously ignores conclusive negative ones, and this although he be gifted possibly with a superior intelligence. All his thoughts are fixed upon himself, and focussed especially upon the particular organ which is the source of his trouble. One doctor after another is consulted, and specifics and nostrums of all descriptions are tried for the cure of the fell disease. He may even be persuaded that this cannot possibly exist, and happier days seem dawning when he becomes aware of vague pains or slight deviations from the normal which plainly point to some serious but indefinite disease.

This condition of affairs is a much more difficult one to cope with than the preceding, for it means that, in place of presenting a definite object for attack, the patient will carry on a guerilla warfare, and no sooner be dislodged from one position than he will assume another. Fugitive burning pains and paræsthesiæ are common in the course of certain superficial nerves, and may also be referred to deeper tissues, such as the brain, heart, or lungs. These become the subject of great concern, and naturally develop and multiply under the attention bestowed upon them. The hypochondriac sometimes does not venture upon a diagnosis, but

is, nevertheless, firmly convinced that something is very seriously wrong somewhere. The symptoms which have so serious an import to him as a rule depend upon some functional disturbance, but it should be remembered that serious organic disease is occasionally present—e.g., cancer of the stomach or aneurysm.

In some cases sexual irregularities, by inducing in the mind of the patient a belief that he is becoming unmanned, cause a similar depression of spirits. In the same way as the hypochondriac whose troubles are of gastric origin, his entire attention becomes concentrated upon the erring organ; books, doctors, and quacks are consulted to no purpose, and he is fully persuaded that impotence is sure to follow. Such a conviction may so prey upon his mind that suicide may be attempted, but the hypochondriac is generally cager to live, and, though in a few cases he be tired of life, he is too great a coward to take it. Apart from questions concerning his health, his judgment is usually clear, and he suffers from no delusions or hallucinations. Sometimes, however, continual brooding over his bodily condition begets a belief of moral unworthiness, and that he is forsaken by God—opinions which at once introduce an element of insanity. The general condition of the hypochondriac is sometimes good and he looks in robust health, but frequently emaciation occurs, and his face wears an expression of anxiety and pre-occupation.

Diagnosis.—The only difficulty arises in determining if any grounds exist for the doubts and anxieties of the patient, for it must not be forgotten that in some cases actual organic disease is present, underlying the morbid mental depression. Hence an examination of greater care than usual is demanded in place of the superficial one which is often given in these cases. An ordinary hypochondriac misinterprets what is presented to his senses, but is not insane unless he develops delusions of unworthiness, &c., or takes an altogether unreasonable view of the case, as that his stomach is made of glass.

Prognosis.—This is never very hopeful, but is better in cases of recent origin, when there is no marked neurotic predisposition and the general vital condition of the patient is good.

Ætiology.—The most persistent forms of the affection occur in those who have a marked family history of insanity. In

others this may be absent, but some chronic derangement, probably of the stomach, has induced a condition of self-analysis which leads to the belief that the trouble is of serious organic origin. Hypochondriasis is essentially a disease of adult life and middle age. Men are more frequently its victims than women, and it is probable that many of the slighter forms occurring in the latter would be called hysteria.

Treatment.—It is an important element in the treatment of these cases that the physician gain the confidence of his patient by a careful review of his condition, and treat it as a real disease rather than as a product of the imagination. An endeavour should be made to relieve his self-concentration by recommending a course of travel, stimulating any interest he may before have felt in any particular hobby, and suggesting means, which will differ in each case, for his employment and the development of his sympathies and social instincts. Sea-bathing and exercise, especially horse exercise, short of that which causes actual weariness, should be also encouraged.

Medicinally, the treatment should be conducted on general principles. Derangements of the stomach, which are nearly always present, should be treated with appropriate drugs; flatulence, with creasote or sulpho-carbolate of soda; constipation, as far as possible with a careful attention to diet, and, failing this, with gentle aperients. Iron should be given in anemia, and Anstie strongly recommends cod-liver oil or other fats, even in cases in which there is no marked emaciation. The usual nervine tonics are not of much value in this condition.

WILLIAM GAY.

HYPODERMIC TREATMENT.

—The subcutaneous injection of a drug is the most speedy method of bringing a person under its influence. There are many reasons which at times render it undesirable or impossible to give a remedy by the mouth, but such contraindications do not affect its administration hypodermically.

All the alkaloids may be thus used, as well as many other drugs; ergot, for example, is frequently used hypodermically to check hæmorrhage. It should be remembered that drugs act more powerfully in this way, and a smaller dose must be used than would be given internally. Care should also be taken that the needle is sharp, and the syringe

should be scrupulously clean. The operator should be careful not to puncture a vein. In timid persons the spot to be punctured may be frozen with a mixture of ice and salt, or brushed with a 10 per cent. solution of cocaine ten minutes before the puncture is made, to obviate any pain.

Some care is necessary before commencing the use of morphine hypodermically in any case where pain is not obviously due to the presence of organic disease, especially in persons of nervous temperament, owing to the risk of inducing the "morphine habit."

HYPOGLOSSAL NERVE, Diseases of.—This is the motor nerve for the intrinsic muscles of the tongue, and also for all the extrinsic muscles, except the mylo-hyoid and digastric, but it does not supply—at any rate in the monkey—the sterno-hyoid, sterno-thyroid, and omo-hyoid muscles, which, in the monkey, obtain their motor supply through the descendens noni from the communicating branches of the first and second cervical nerves. Stimulation of the distal end of the divided hypoglossal of a monkey inside the skull is not followed by contraction of the depressors of the hyoid bone (see *Proc. Roy. Soc.*, vol. xlv., a paper by Mr. Horsley and the writer).

Two affections of the hypoglossal nerve are described—viz., paralysis and spasm. The former only is of importance.

Paralysis.—Like the facial, the hypoglossal nerve may be affected at its nucleus, outside the medulla, or in its course from the inside of the skull to the tongue. The movements of the tongue are also affected in lesions of the so-called motor cortex, and also of the motor fibres passing down from the cortex through the internal capsule and crus cerebri to the opposite hypoglossal nucleus. This form of paralysis of the tongue is discussed under the heading of HEMIPLEGIA (*q.v.*), and it may be remarked here that, whereas in lesions of one nucleus or one nerve, only the muscles of the corresponding half of the tongue are wasted and paralysed, in the case of the cortex or internal capsule some of the muscles of both sides of the tongue are paralysed for certain movements, but the muscles do not waste, and their electrical reactions are not altered, while, at the same time, there is usually some paralysis of the face and limbs of the same side.

Tumours in the substance of the medulla, or atrophy of the cells of, the

nucleus, as in bulbar paralysis (*q.v.*), will cause paralysis of the tongue. In the former case, the condition is associated with paralysis of the limbs of the opposite side; in the latter, the disease is usually bilateral, and is associated with atrophy and paralysis of the muscles of the lips, pharynx and larynx.

Outside the medulla, the hypoglossal nerve is liable to be compressed by tumours, syphilitic growths, or meningeal exudations, and it is particularly associated with lesions of the accessory nerve to the vagus, producing paralysis of the tongue, soft palate, and vocal cord of the same side. Caries of the upper cervical vertebrae may produce paralysis of the hypoglossal. Between the exit from the skull and the tongue the nerve is liable to be compressed by tumours in the neck.

In *paralysis of one half of the tongue* the muscular tissue atrophies, the mucous membrane is thrown into folds, and when protruded the tip goes towards the paralysed side. When resting in the mouth the tongue cannot be put over towards the paralysed side, and, if both sides be affected, it cannot be protruded beyond the teeth. In unilateral paralysis, speech and the power of swallowing are not much affected; but in *double paralysis*, pronunciation of the linguals and dentals is impossible, as this condition is most commonly associated with paralysis of the lips; all speech is lost, and, if the larynx be not involved, the patient can only phonate the vowels. Mastication and swallowing are also very difficult if the tongue cannot control the direction of the bolus of food. In bulbar paralysis, fibrillar tremors are observed. The electric reactions are altered when the nerve is involved, those of degeneration being obtained, while in bulbar paralysis, the muscles, as long as they exist, react to the faradic, but at the same time give the reaction of degeneration with the constant current.

Diagnosis of the seat of the lesion can usually be made by a careful examination of the extent of the paralysis and its association with other muscles. Bulbar paralysis is almost invariably bilateral, or soon becomes so. A unilateral paralysis, not associated with loss of power in the opposite arm and leg, usually signifies a lesion (often syphilitic) situated outside the medulla, and this is the more likely if it be associated with paralysis of the soft palate and vocal cord of the same side.

Prognosis is always unfavourable.

Treatment of unilateral paralysis should be anti-syphilitic, on the chance of that disease being the cause of the paralysis. Tonics and local treatment with the constant current, the positive pole being applied to the back of the neck, and the tongue gently stimulated by drawing the negative pole along it, and the administration of tonics, are measures to which a trial may be given. The treatment of bilateral paralysis is most commonly the same as that for bulbar paralysis (*q.v.*).

C. E. BEEVOR.

HYSTERIA and HYSTERO-EPILEPSY.—Hysteria, says one of its most patient students, never has been, and never will be, accurately defined; but we may say this much, that it is a state of functional disease of the nervous system with an almost unbounded variety of abnormal physiological symptoms, and with a strong tendency to the imitation of other diseases, and, further, that along with this there is associated some mental abnormality which is never purely intellectual, but at least in large part emotional.

It has a physiological as well as a psychological side, but it has no pathology that is distinctive; *i.e.*, it is associated with no known and constant abnormality of tissue.

The name arose from a genuine belief of the earlier Greeks, which originated before any study of pathology was attempted, that such states as this were due to shiftings and abnormalities of the uterus (*ὑστέρα*), and it is retained for historical convenience rather than descriptive accuracy, though the close interweaving in some cases of crises and impulses arising from the feminine reproductive system with various of the hysterical changes and abnormalities, is sometimes put forward as a lame *ex post facto* justification.

In about nineteen cases out of twenty the symptoms are found in women, and are rather more frequent in the decade between the ages of fifteen and twenty-five than in any other. The male cases, as a rule, are somewhat older. In a large minority of cases there is an inheritance of some nervous incapacity from the parents, not always of hysteria itself, but to a less extent of epilepsy, insanity, alcoholism, or of spasmodic neuroses, such as chorea, torticollis, and tic. All members, indeed, of the neurotic group of diseases have some relations with the arthritic family, so that we are not surprised now and then to see as close a connection between rheumatism and

hysteria as there is between rheumatism and insanity, and sometimes, also, between tuberculosis and hysteria.

Hysteria does not limit itself to one type of climate, or one family of races, though it is more at home among an educated people and a white-skinned race. The negroes, their observers in the United States tell us, have only had hysteria since emancipation (Hammond). It used to be a commonplace that it was the result of the cloister life of a religious sister; that fashion of life is less familiar now, and it is commoner to trace the hysterical symptoms as sequelæ from a life of indiscriminate indulgence. An excitable nature in exciting surroundings may reach a condition where a fit of hysterical convulsions may be determined by a trifling accident, emotional or physical, and a fright that is no more than a surprise, or a railway accident that is no more than the tremor of an express, may give rise to terrors that seem agonizing, or originate a hysterical hyperæsthesia that makes the spine too tender to be touched. If the results meet with sympathy, and the subject comes across others in whom similar symptoms have been more fully developed, some imitation is not likely to be avoided, and an epidemic may be started by neuromimesis which is practically baseless, but not fraudulent.

Bearing in mind, then, the mental substratum, of which more hereafter, we may look first at the other symptoms in more detail. Their mode of onset is commonly gradual. An impressionable, nervous child may grow up with constantly overwrought emotions—fits of crying, sobs, tremors, palpitations, headache, sickness, a fastidious appetite, and fancies that slowly declare themselves abnormal. In the adult, some discomfort of head or stomach may be gradually magnified till it becomes all-absorbing, and perverts a natural habit of life, though, possibly, in only one or two particulars. Much more rarely the first easily recognizable symptom is a fit of convulsions which is the outburst of a slowly gathering tendency.

The most radical division of the bodily symptoms is into the paroxysmal symptoms and the non-paroxysmal and inter-paroxysmal. (A) The **paroxysmal symptoms** do not, in England, decidedly present themselves in more than about half the cases where there is some clear evidence of hysteria. Their immediate origin may be in strong emotion or after long fatigue and strain; but if, as is so often the case,

successive attacks have broken down the self-control, a trifle may be sufficient cause, so that to any one unacquainted with the previous history and tendency of the patient they may seem spontaneous. The patient will often describe the ordinary or minor paroxysm, in the subsequent days when she has recovered a more settled equilibrium, as beginning with a feeling that is essentially anomalous, like many of the forms of aura in epilepsy, something that alters the plane of consciousness, and is, perhaps, accompanied by a sense of constriction at the waist, or weight on the epigastrium, or pain starting from the hypogastric region, and blending itself quickly with the sensation of *globus*, rising like a ball in the throat, and causing an ever-increasing choking, which can only be relieved by screaming and sobbing, and universal convulsions more or less violent that have some traces of purposive method, and no constant mode of progress.

These are generally attended by an incomplete unconsciousness and some regard to self-preservation, so that the patient, though perhaps tossing herself about violently and falling heavily without an obvious guard, yet by a subconscious wisdom avoids the fire, and does herself no very serious harm. Such a paroxysm ends gradually after the screaming has subdued itself into mutterings and moans, tears and sobs, or else, after a quiet time, as of syncope with an occasional sigh, by a slow return to complete consciousness, and a more or less incomplete memory.

There is a wide range of variety in such scenes, and the individual character and habits of the patient may make themselves felt in many ways. Many are very short and trivial. An impression of the internal predominance of a separate power of evil or good, which overpowers the actions and the will, is one of the more serious interpretations of this sudden loss of self-control, and may lead to the terror or horror of what has been widely known as "possession," with its attendant struggles and hallucinations of a morbidly active imagination. Or, if there be less discomfort and more self-confidence, it may result in a temporary exaltation, or even ecstasy, in which the limits of the possible or the material seem easy to overstep. Again, in the weak and anæmic subject the attack may have more of the character of a fainting-fit, especially if there be some undercurrent of secret emotion that leads to exhaustion. In some of the severer

cases a comatose state may supervene, which has to a superficial observer the look of apparent death, but in which some tremor of the eyelids, and remaining sensibility of the conjunctiva and iris, as well as the persistence of the circulation, as shown by the results of deep puncture of the muscles, if not by the heart sounds or pulse, furnish sufficient grounds for a diagnosis.

Hystero-Epilepsy.—There is a group of severe and elaborate cases which has become stereotyped in the judgment of some French observers of the school of the Salpêtrière, as having an ideally complete course of prodromata, aura, and four periods of paroxysm—the epileptiform period, the period of *clownisme* (Charcot) or contortion, that of emotional attitude and gesture, and that of delirium. To a long display comprising these or the greater part of these symptoms, the name of *Hystero-epilepsy* or *Hysteria major* has been given. This is of use as a short term for a complex whole, so long as it is remembered that it is not intended to connote epilepsy in hysterical dress, or epilepsy complicated with hysteria, but only hysteria with some imitation of epileptic symptoms. Any attainment of the complete type, except in the Salpêtrière school, is very uncommon, but various portions in varying intensities are more widely seen.

The prodromata on the psychical side are marked, as in other hysterical cases, by neglect of the minor duties of life, foolish carelessness, excitable perversity, and perhaps some pleasure in grumbling; and on the physiological side there are likely to be some perversions of taste or sensation, some dyspeptic symptoms of nausea or tympanites, some polyuria or ptialism, and some muscular tremor or paresis.

In such a state there is frequently peculiar sensitiveness of some limited parts of the body, where a light touch may excite convulsions, and in some cases a deeper pressure control them. These "hystero-genic" spots are generally bilateral and symmetrical, and most commonly in the hypogastric, iliac, or submammary regions, but sometimes in the nerve trunks (Pitres and Gaube) or elsewhere.

The first period of convulsion is the most epileptiform, of less abrupt onset and longer duration than true epilepsy, without the epileptic cry; beginning perhaps with grinding of the teeth, and going on to some tetanus, with cyanosis,

marked opisthotonos and spasms of the arms in flexion, and legs in extension, repeated several times, and followed by a more clonic state of oscillating spasm of arm, or leg or body, which resolves itself gradually, after some foaming at the mouth, into a condition of relaxed muscle, and possibly stertor. If the complete course be pursued, after three or four minutes (P. Richer) of the epileptiform state, a period of miscellaneous contortions follows in which there is probably some beginning of the return of consciousness, and this is succeeded by a series of displays of emotion and plastic cataleptic poses, and that again by a confused delirium of recollections and illusions, which may last several hours or more, but gradually gives way to an inter-paroxysmal condition in which the functions may be completely normal, or on which the paroxysm may have left some trace in the form of the acquisition or disappearance of a contraction, a paralysis, or a mental perversity.

That any such exact sequence or tabulated form of symptoms should be systematized into a complete type of the malady of which all other manifestations are incomplete reproductions (P. Richer) implies a theory of disease which needs confirmation, and its occurrence chiefly among groups of patients where imitation is possible must be considered along with the quick susceptibility of a morbid class, such as the hysterics, to mould themselves to what is expected of them, and to become amenable to suggestions more or less unintentional and unconscious.

The resemblance to epilepsy does not go on to the extent of producing a *status epilepticus* with a high temperature and dangerous to life, though in a few rare cases the epileptic symptoms occur of bitten tongue, and, after the convulsion, of pupils almost insensitive to light; and indeed there is nothing to forbid the possibility of epilepsy concurring in the same patient as hysteria. The term *hystero-epilepsy* was more loosely used in the last generation, and is still sometimes applied to cases in which the symptoms of a simple attack by themselves were inadequate to establish a diagnosis without further knowledge of the antecedents, consequences, and concomitant habits.

(B) **Non-paroxysmal Symptoms.**—The symptoms which do not play a part in the paroxysmal attacks are of most Protean variety, and may pervert

nearly every function of the body towards excess or defect.

(1) *Motion*.—The group which borders most closely on the paroxysmal is that which includes some involuntary movements.

The *globus hystericus*, which the subject feels as some sudden obstruction rising in the throat, is due to an upward wave of muscular contraction in the œsophagus, and a spasm of the constrictor muscles of the larynx, and not unfrequently similar contraction may originate in the stomach, and produce sickness on very trifling or imperceptible irritation, and the impulse of regurgitation may spread so far down the bowel as to cause vomiting of most unusual matters, possibly even enemata (Briquet, Grasset) so as to satisfy the morbid desire of the patient for what may seem unprecedented. In a few cases in which the vomiting immediately follows swallowing, it has been well proved that the œsophageal muscles have thrown up the food before it has reached the stomach (Bristowe). Again, there may be many local troubles: the voice may be wholly lost, or more frequently there may be obstinate refusal to raise it above a whisper, or an imitation of the cries of animals may be resolutely adopted instead of human speech. The frequent hiccough, or *asthma uteri* of the ancients, the almost purposeless fits of laughing and crying, the irregular attacks of dyspœa, the anxious feeling of laboured cardiac palpitation, with some irregularities of rhythm, are some of the commoner symptoms which are often adopted as diagnostic, and so, too, is the hard, frequent cough that is a habit, and spasm without catarrh. There is rarely urethral spasm leading to some suppression of water (*ischuria hystérica*), and still more rarely a curious type of chorea, with regular rhythmical spasms for long periods, sometimes flapping of the hands, sometimes bowing of the body.

Of the motor symptoms, after the attacks are over, the *contractures* by tonic muscular spasm are not unfrequent, the apparent paralysis commoner and more inconvenient. The contractures generally affect one limb only, and are never accompanied by the organic hemiplegic affections of the facial muscles. There is most often flexion of the elbow or wrist, and extension of the knee or ankle, and many varieties of posture may supervene. The position and pain of disease of the hip-joint

may be very closely copied without any fraudulent intent, and examination under an anæsthetic may be often necessary before a satisfactory diagnosis can be made. Pain in such joints rarely prevents sleep, but recurs on waking, and spreads over a wide area, and one less intimately connected with the nerves of the joint than organic disease. The relaxation of the abdominal aorta, with the in-gathering of some of the muscles round it, may produce symptoms somewhat like those of a true abdominal aneurysm. But it is very variable, generally abnormally tender to manipulation of the surface even, and may be best investigated under an anæsthetic.

The condition of hysterical *muscular paralysis* is one that, in varying degrees, is very often seen, and one whose exact limits it is sometimes impossible to define. Its onset may be spontaneous, or it may follow a fit or emotional crisis; as a rule, it is accompanied by anæsthesia, without alteration of the electrical reactions of the muscles, and affecting the limbs from joint to joint rather than over the more elaborate distribution consequent on the initial injury of a nerve centre or nerve trunk. There is often aphonia, a condition common for a moment in normal vivid emotion, which may be indefinitely prolonged either absolutely, or as a whisper, for many months possibly. Its rapid onset and rapid cure, combined with the free motion of the vocal cords under the laryngoscope, are its best diagnostics.

(2) *Sensation*.—In sensation there is almost always some change from the normal, either increase, decrease, or perversion. The partial anæsthesia of the skin is one of the most frequent symptoms, though it may not be noticed by the patient, and may be so variously localized that it is difficult to find, especially if, as is sometimes the case, it be interspersed with hyperæsthetic patches. Its commonest distribution is over one limb or one side of the body. The want of sensitiveness to pain, to heat, to touch, to electrical changes, to contact (alphagesia, Pitres), do not vary concomitantly, as a rule. The anæsthesia often extends to the mucous membrane of the pharynx, nostrils, and vagina; less often to the conjunctiva, meatus auditorius, and membrana tympani. Hyperæsthesia of the breasts is common, of the genitalia occasional. In the extreme tenderness generally attributed to the ovaries, it is hard to say whether myalgia plays a part. A joint may be exceedingly sensi-

tive, and at first sight resemble organic disease, but it is characterized by being as tender in the skin as in the deeper parts (Brodie). Many of the miseries of neuralgia belong to this morbid class.

The *special senses* are also affected. There is sometimes amaurosis after sudden light, sometimes amblyopia; in the more advanced cases some achromatopsia. The experience hitherto has been that the discrimination of violet and green has been lost earliest, and that of blue and red retained longest. There is often retraction of the field of vision, rarely central scotoma or hemiopia. The sense of taste is more often blunted or lost, of hearing made more acute. In such a condition there is occasionally hallucination, in some cases visual, in more auditory, of a more fanciful nature than the rarer hallucinations of normal mental and physical life. The most complete investigations that have been made at present show very little, if any, greater susceptibility to hypnotism in hysterical cases than in normal subjects of similar age, race, and education (Bernheim, Grasset).

(3) *Circulation, Secretion.*—The instability of the vaso-motor system is a noteworthy point, and leads not only to rapid blushing and pallor, but in a few rare cases to subcutaneous hæmorrhage, hæmoptysis, and hæmatemesis, for which no explanation by fraudulent action has been thought adequate, though there can be no doubt there has been persistent deception in many cases. The secretions, too, have been affected. The rapid secretion of almost colourless urine after a paroxysm is one of the most constant symptoms; the long continuance of almost complete suppression of urine is sometimes simulated, and is in rare cases genuine (Charcot). Vomiting is a very frequent annoyance, and may proceed to such an extent as to become one of the most dangerous accidents, especially when complicated with obstinate constipation. Pyrexia and, occasionally, hyperpyrexia occur for which no organic or fraudulent origin can be found, and which may the more reasonably be considered to depend possibly on a morbid nervous condition in proportion as the evidence of hyperpyrexia, dependent on organic cerebral or spinal injury, gathers strength (Traube, Billroth, Ch. Richet). General nutrition is, as a rule, good in hysteria, compared with the diseases which it simulates, and practised observers have reported as much as ten

days' abstinence from any nutrition without serious injury (Brudenell Carter).

(C) *Psychology.*—The mental condition is one of the most variable and the most obscure of the constituents of hysteria. It is one of the essentials of the malady that the mind is not in all respects normal. There may be at first sight a condition of apparent equilibrium, stability, and good judgment which has some unconscious weak point in it, or which may be deliberately assumed to cover some morbid deceit conceived probably from an emotional cause. The desire to attract attention or to gain sympathy is one of the morbid habits of most far-reaching consequences, and may seek to attain its ends by making its victims show themselves martyrs not only in word, but in deed. They may scald themselves, blister themselves, wound themselves under circumstances when such anæsthesia as they have does not cover the pain, but where the obvious injury may do something towards gaining pity and sympathy. The absolute abandonment of truthfulness in persons of previously high character is striking, and sometimes hard for the friend or lay critic to believe. It is a point of morbid psychology not to be judged by normal standards. In some of the paralytic and lethargic states it has been very truly said of the mental side of their inertia that it is not that they cannot or they will not, but that they cannot will.

(D) *Diagnosis.*—Amid such a mass of functional symptoms in subjects avowedly imitative it is not to be wondered at that some cases of confusion with organic disease occur, and the occasional concurrence of hysteria with other diseases makes its exact limits impossible to determine. In the diagnosis from epilepsy in a single attack there may be insufficient evidence; the most important is the absence of the initial sharp cry, the more gradual onset of the paroxysm, its connection with surrounding emotional conditions, the absence of the signs of complete unconsciousness in action, and the absence of the post-epileptic insensibility of the iris. Of positive signs of hysteria we are gaining more confidence in the abnormalities of sensation such as are found by practised observers in as many as 93 per cent. of cases (Berbez). The retraction of the visual field, the segmental or patchy anæsthesia, most amenable to test observations when affecting the larynx, are some of the more important points. The untrustworthiness of the patient's word, and their

readiness to adopt any suggestion, render it necessary to seek evidence of which the bearing is to them obscure. Among the motor symptoms, a hemiplegia entirely without initial facial paralysis, a monoplegia without ascertainable local origin, a contracture coming on in sleep or in a few hours without antecedent paralysis, and the complete resolution of the contracture or disappearance of the paralysis under hypnotism or chloroform, is strongly confirmatory. At the same time, it is at least conceivable, though perhaps at present beyond strict proof, that what has begun as functional may go on to be organic; that a truly hysterical contracture may slowly turn into a sclerosis of the pyramidal tract (Charcot). That the mental condition of hysteria should have no hard-and-fast line to distinguish it from insanity, is in accordance with the boundaries of insanity on all sides, and for the hysterical patient to overstep the conventional line is not at all infrequent.

(E) **Prognosis.**—That anything truly hysterical will not be fatal is practically certain, but the length of duration of the symptoms and their severity depends in part on the individual constitution, and in no small part also on the firmness, tact, and patience with which they are treated.

(F) **Treatment.**—There is something to be done by prophylaxis in the children of neurotic parents; the nutrition needs attention, and strengthening by an extra amount of fresh air and exercise; the adverse possibilities of over-work must be avoided, and any chances of the difficulties of over-attention, luxury, and unrestrained wilfulness duly combated. When the malady has declared itself, and some of the symptoms are before us, we have more definite indications for treatment. If the patient be first seen in a paroxysm, and the disease found to be uncomplicated, there is perhaps a greater claim for neglect than for attention; a middle course may be in some ways convenient, but is none the less inappropriate.

If the patient be freed from all restraint, and left alone in a bare room till the fit is over, she will present her-

self, after a time, naturally recovered, and the probability of the recurrence of such an attack is materially lessened. But such treatment, to be successful, must be firm, based on a good diagnosis, and well supported by the friends and attendants in taking no notice of the symptoms between the attacks, and affording the patient no sympathy. It is rare that such a treatment can be carried out in family surroundings, and methods of strict isolation have met with much success, especially when malnutrition was part of the malady, and could be met and overcome by massage and a strict regimen of plain but abundant diet (Weir Mitchell). A careful treatment by hypnotism is beginning to claim some attention, for though by no means all hysterics are hypnotisable, yet in a fair proportion a hypnotic state can be induced in which post-hypnotic suggestions of the giving up of hysterical fancies, and the real extension of self-control, will be received and acted upon (Moll, Liégeois, Charcot, Grasset). If it be decided to give immediate attention to the attack, and treat it by active measures, a sudden and disagreeable shock by a strong electric discharge or bucketful of cold water may be effectual in stopping it, and sometimes violent pressure on the iliac region is found to have special efficacy, possibly as affecting the ovary. Chloroform and amyl nitrite are dangerous.

For the more chronic symptoms the administration of very offensive medicines, such as assafœtida, castoreum, &c., has no solid foundation, and is being gradually given up. A treatment by potassium bromide has little or no effect, and is very notably different to its action in epilepsy. Electricity and magnetism have no special virtue except as inducing passive exercise, which is useful in paralysis, and, if necessary, giving a sufficient shock, both mental and physical, to dissipate some paralyses or hallucinations. A careful and firm hand in keeping up a strict regimen and good digestion is very important; and, whilst undue attention is avoided, some of the emotional causes may be discovered and rectified.

A. T. MYERS.

I

ICHTHYOSIS (Fish-skin disease) is a congenital condition in which the skin is dry, rough, scaly, and covered with thick plates or wart-like growths.

I. Ichthyosis simplex is the commoner form of the disease, to the milder cases of which the term "Xeroderma" has, somewhat unnecessarily, been applied.

In such cases the skin is merely dirty-looking, dry, harsh, with constant furfureous desquamation and exaggeration of its natural lines and furrows. In severer cases large, thin, pearly, angular squames or thick plates are formed, which are separated by deep fissures or rifts corresponding in direction to the natural lines of the part; they are usually of a dirty grey colour, but may acquire a deep brown or greenish tint from decomposition of sebum and the accumulation of dirt upon them. The plates are adherent at the centre, detached at the circumference, and can usually be separated from the subjacent skin without causing bleeding. The appearance caused by these conditions to some extent resembles that of the skin of a fish or reptile.

Ichthyosis generally attains its maximum of intensity over the tips of the elbows and knees, above the ankles, and over the backs of the thighs and shoulders; it is seldom well marked on the scalp and face, and least of all in the flexures of the elbows, axillæ, knees and groins. The palms and soles are generally moderately affected, but in exceptional cases they may be the only parts attacked (*Ichthyosis palmaris et plantaris*: see CORN and CALLOSITY). The hair is scanty, lustreless and dry, the nails brittle, the lobes of the ears sometimes badly developed. In many cases there is heaping up of sebum and epithelium round the orifices of the hair follicles, especially upon the extensor surfaces of the arms and legs, producing a condition identical with *keratosis pilaris* in appearance; in many mild cases this often constitutes the most prominent feature (*I. follicularis*).

Sweating only occurs from the less ichthyotic portions of skin; it may be especially abundant in summer. The sweating softens and removes the scales and affords great gratification to the patient; but the advent of winter always

brings about an aggravation of the condition. Beyond slight itching, subjective symptoms are seldom complained of; but the skin being very vulnerable, troublesome dermatitis is of very frequent occurrence, especially upon exposed parts (*e.g.*, the face), and may mask the true nature of the disease.

Pathology.—Ichthyosis must be looked upon as a deformity rather than as a disease, the pathological changes consisting in abnormal thickness of the horny layer of the epidermis, and enlargement of the rete mucosum and papillæ, the vessels of which are dilated. The sebaceous glands are deficient in number and poorly developed, but the sweat glands are normal.

Ætiology.—Ichthyosis is sometimes hereditary and frequently affects several members of the same family. Although probably always present at birth it does not generally attract attention before the second or third year of life, as frequent washing is temporarily beneficial; at puberty the disease may either diminish or become intensified to a marked degree.

The condition known as "Harlequin fœtus" exemplifies the most exaggerated form of ichthyosis; it begins during intra-uterine life, and its subjects are always born prematurely, and have no external ears, eyelids or lips. One case has been known to live nine days.

"Ichthyosis linguae" is an unfortunate name used to designate a condition in no sense related to true ichthyosis.

Ichthyosis has been known to disappear completely after the exanthemata; it must be differentiated from *psoriasis universalis*, *eczema*, *dermatitis exfoliativa* and *seborrhœa tabescentium*.

Treatment, if diligently followed, is usually of signal, albeit temporary service. Frequent frictions with soft soap, followed by warm alkaline or bran baths remove the scales. The subsequent inunction of vaselin, oils or greases, glycerin or glycerin of starch, or a 5 per cent. naphthol ointment tend to keep the skin smooth and supple. Internal remedies are of little or no use, but *jaborandi* or *pilocarpine* might receive further trial.

II. Ichthyosis hystrix (*Hystricismus*) is a much rarer disease than the preced-

ing, and by no means closely allied to it, although the two have been said to co-exist.

The lesions are warty-looking growths consisting of elongated and hypertrophied papillae covered by greatly thickened, dark brown, horny epidermis, and forming flat-topped or pointed, spinous projections. These are grouped together to form patches, often unilateral, and distributed along the course of cutaneous nerves like zoster—*i.e.*, transversely on the trunk, longitudinally on the limbs. They are seldom present on the face, and if bilateral are never symmetrical. When situated on exposed parts, as the hands—where they are common—the horny caps are liable to be pulled off; in these circumstances only are they the cause of pain or other subjective symptoms.

They may be mistaken for warts or naevi.

Treatment is of service in mild cases in which the lesions are strictly localised. Scales may be removed by repeated warm alkaline baths with soft soap; or by soaking with a dilute solution of liquor potassæ. Concentrated solutions of salicylic acid in collodion or alcohol may then be painted on. Sometimes patches are best removed by scraping.

J. J. PRINGLE.

IDIOCY.—Idiocy is a defective development of the mental powers, dating from birth or early childhood. Imbecility is a minor degree of mental deficiency.

Symptoms.—The symptoms are physical as well as mental. The most important of the former are a general coarseness of the features and a lack of expression, thick and often everted lips, and a large, coarsely papulated tongue. The teeth are irregular, from delayed or abortive dentition and caries; the gums are swollen, and there is constant slavering, often with an offensive smell. The palatal arch is high and its development is asymmetrical; mastication is defective and often disgusting. The gait is waddling or staggering, and various paralyses and contractures of the limbs may be present. The powers of nutrition are imperfect; and the extremities cold and livid. One or more of the special senses may be absent or deficient. There is frequently strabismus. Mentally, the lowest class of idiots are organisms more helpless than the mindless plant, and in the best classes there is considerable weakness of the powers of attention, comparison, judgment, memory, fore-

sight and volition, and either complete absence, or only a slight development of the faculty of speech.

Idiots are very prone to learn bad habits, and to become mischievous and destructive, and are subject to attacks of mania or melancholia. Epilepsy, which is one of the chief factors in the production of idiocy, may also develop in an idiot. Masturbation is a common symptom and most difficult to check. When paralyses are present, choreiform movements and double athetosis are common. Stammering is also a common feature.

Varieties.—The following are the varieties usually described:—(1) Genetous, (2) Microcephalic, (3) Eclampsic, (4) Epileptic, (5) Hydrocephalic, (6) Paralytic, (7) Cretinism, (8) Traumatic, (9) Inflammatory, (10) Idiocy of deprivation.

(1) *Genetous Idiocy.*—The name is unfortunate, but is used to include cases in which, although the causation is indefinite, the condition dates from foetal life. Neurotic inheritance is the chief factor in the majority of such cases. The prognosis is fair when the physique is good, when there is some power of attention and some power of speech is shown by the time the child reaches the age of six years.

(2) *Microcephalic Idiocy.*—The chief point to be noticed is the smallness of the head. It is probable that a circumference less than eighteen inches implies idiocy. In these cases it is more likely that the skull ossifies over a brain which has ceased to develop, than that the growth of the brain is arrested by premature ossification of the skull. Microcephalic idiots are active and full of life, and improve greatly under proper training.

(3) *Eclampsic Idiocy.*—It is said that fourteen per cent. of cases of idiocy are due to infantile convulsions, but in the great majority of cases convulsions in infancy do not end in idiocy. Convulsions probably act as a predisposing cause to idiocy in a brain which is hereditarily weak, and are themselves a symptom of that weakness. Infantile convulsions are extremely common in the offspring of the insane. Idiots of this class do not admit of much improvement by training.

(4) *Epileptic Idiocy.*—In the eclampsic variety the fits are the starting-point of disease, but soon cease, while in the epileptic class the fits are both the starting-point of the disease, and a prominent feature throughout life. Epilepsy in

adults has a strong tendency to cause weak-mindedness, and on the developing brain of early childhood its influence is most fatal. Epilepsy developing before the seventh year will cause idiocy, but epilepsy may develop at any period when idiocy is established. These cases, like adult epileptics, are most troublesome, they are irritable, impulsive and pugnacious, but it is generally considered that the prognosis is as favourable as in other classes of idiocy, if not more so, and much may be done for them by proper training. The diet should include but little meat.

(5) *Hydrocephalic Idiocy*.—Hydrocephalus may develop either before or after birth. Generally it appears before the age of six months. It may terminate in weak-mindedness, or have but little effect upon the mental powers. The head is globular, widest in the frontal region, and sometimes flattened in the occipital region. There is usually deficiency of one or more of the special senses, and the limbs are puny. The aetiology of the disease is most indefinite, but tubercle, rickets, serofula, and hydrocephalus seem to flourish together in degenerating families. As regards prognosis, if the hydrocephalus be stationary and convulsions do not supervene, great improvement may be expected under proper training. Nourishing diet, cod-liver oil and iron are the main indications in treatment.

(6) *Paralytic Idiocy*.—Paralyses may exist from birth without causing idiocy, but some arrest of mental development is the rule. One or more limbs cease to grow and become atrophied and contracted. The paralyses are due to brain lesions caused by injury either before or after birth, or the result of inflammation, abnormal growths, or rarely hæmorrhage. Some mental power may be developed, but the physical condition admits of little amelioration.

(7) *Cretinism*.—This condition is fully described in the articles on CRETINISM, ENDEMIC and SPORADIC (*q.v.*).

(8) *Traumatic Idiocy*.—This class comprises cases in which the head has been injured during attempts at abortion or in delivery, or during early childhood. There may be distinct damage to the brain, or merely shock, and the degree of mental deficiency varies much, and bears little relation to the amount of apparent injury. Heredity unquestionably renders the brain more liable to suffer in this way.

(9) *Inflammatory Idiocy*.—The cases

described under this head belong usually to the last class. A few cases are said to result from the inflammation of the internal ear which is an occasional sequela of the specific fevers, but this is doubtful.

(10) *Idiocy of Deprivation*.—As the development of mental power is dependent upon that of the senses which bring the organism into relation with its environment, the deprivation of two or more of these senses must cause mental deficiency. The early training of the existing senses is the only treatment, and the case of Laura Bridgman shows how much can be effected in this direction.

Ætiology.—There are two males to one female idiot, and this is attributed with some reason to the larger size of the male head at birth. The premature closure of the fontanelles, and the small size of the frontal bone, must be regarded as the effect rather than the cause of the cessation of brain development.

In this, as in all forms of insanity, heredity is the great factor, 50 per cent. of the cases being demonstrably due to this cause. The inheritance passes most readily to children of the same sex as the affected parent. With heredity must be considered the other causes of the mental and physical degeneracy of families, among which the following are the most important.

The influence of drink is unquestionably most potent for evil, and is transmissible, and culminates in neurotic developments, but the statement that a drunken condition of the father at the moment of procreation will result in the idiocy of the offspring is most improbable. Idiocy is common among the children of aged parents, and among families in which tubercle and serofula are present. The consanguinity of parents and the existence of hereditary syphilis have but little ascertained influence in the causation of idiocy. In cretinism we have a general condition which has already been discussed, and finally some cases of idiocy are sporadic, and are considered as examples of reversion. Idiocy due to deprivation of the senses has been already described as a special variety. In this connection it may be mentioned that certain ethnological types have been discovered among idiots, and that examples of Ethiopian, Malayan, Mongolian, and other types have been described. These cases are most interesting from the point of view of the evolutionist.

The connection of chronic criminality and idiocy is probably intimate but has not been clearly proved.

Treatment.—In idiocy the defect of mind is always associated with a variety of defects of body which can be met by the ordinary resources of the physician and need not be further discussed here. Abundance of good food, warm clothing, healthy surroundings, useful employment, varied amusements, and the attention and supervision of kindly and skilled attendants, are here, as in all varieties of insanity, the main indications in treatment.

Idiots should be treated in separate wards in asylums, or in institutions devoted to their care, and should not, as is too often the case, be associated with adults, much to the detriment of both. Among the most useful means of treatment, may be mentioned classes for education in reading and arithmetic, sometimes drawing and music; for the patients of suitable physique, drilling, gymnastics, and out-door games, the teaching of trades, such as mat or brush-making, printing, or carpentry, at which occupations some idiots evince extraordinary mechanical skill. Dancing and theatricals will be appreciated by a large number of cases. But the physician must be contented with moderate improvement for he is dealing with an organism whose potentialities are limited. The most important question will often be whether the patient should be kept at home after the age of five. For the sake of the other children, removal to a suitable institution is to be advocated, and the case will benefit by the systematic training, and will not be discouraged by the constant comparison with normal childhood which is unavoidable in home treatment.

GEORGE REVINGTON.

ILLUSION.—Illusions are false perceptions of objects actually present to the senses, as distinguished from hallucinations where there is no external stimulation of the senses. The distinction is somewhat artificial, as no place is so still or so dark, but that some stimulation of the senses takes place, and so far as this is true, all hallucinations are illusions. Illusions become evidence of insanity when they cannot be corrected by the reason.

IMPETIGO (*I. contagiosa*; *Por-rigo*).—An acute, inflammatory, contagious, pustular disease most frequently met with in children.

The term is employed by many dermatologists to include two clinically separable pustular disorders, the one belonging to the eczema group (*E. impetiginosum*) and characterised by abundant pustulation without infective characters; the other a specific contagious disorder. It is more accurate to limit the term to the latter disease.

Impetigo is characterised typically by the rapid outbreak of vesicles which quickly become pustules. The pustules are large, flat, occasionally umbilicated, and are surrounded by a narrow, deep-red areola; they contain sero-purulent infective fluid which, on being conveyed, by the hands or otherwise, to other parts of the body or to other persons, reproduces the eruption. The pustules soon rupture, their fluid contents dry up to form dirty, thick, yellow scabs and crusts; by the coalescence and fusion of individual pustules extensive scabby areas are formed. The neighbouring lymphatic glands become enlarged and tender, but seldom suppurate. There is little or no pain, and no itching, unless the condition be secondary to other itching diseases (especially pediculosis and scabies), as is very frequently the case. In the course of two or three weeks the crusts fall off spontaneously, leaving a red, glazed base which rapidly heals without scarring, but considerable pigmentation may persist for some weeks.

The disease is very common on the scalp, face, hands, feet and genitalia of children, especially among the dirty and ill-fed children of the poor. It frequently affects several members of the same family, and becomes, in a certain sense, epidemic among school-children. The dermatitis provoked by pediculosis and scabies, by scratching in prurigo and urticaria, or even in simple eczematous eruptions, is liable to become impetiginous, the transition being marked clinically by the development of infective properties in the pus. Impetigo often follows vaccination, the pus which has developed infective properties being inoculated elsewhere by scratching.

Various observers are not agreed as to the exact specific element; some describe mycelial threads in the base of the pustules resembling those of trichophyton tonsurans, others describe cocci, whilst others, though they affirm the infectivity of the condition, have failed to discover any pathogenic organism.

Treatment is usually rapidly successful, but relapses are common unless the child be isolated, which is rarely possible.

Crusts and scabs ought to be removed by poultices, or rags soaked in olive oil, and ammoniated mercury ointment applied to the exposed surface, diluted if there be very extensive excoriation or active inflammation. Pediculi must be exterminated and scabies treated as elsewhere described. Cod-liver oil and iron are often beneficial.

J. J. PRINGLE.

INCUBATION is the development of a disease, and the period of incubation is the time which elapses between the exposure to the poison and the first symptoms of the disease. It is sometimes spoken of as the latent period. It varies greatly in the several infectious disorders, and its probable duration will be found under the different diseases. (See also Table, p. 187.)

INFANTILE PARALYSIS (*Acute Anterior Polio-myelitis; Acute Atrophic Paralysis; Essential Paralysis*).—Paralysis of one or more limbs or of groups of muscles coming on suddenly, and soon followed by rapid wasting of the paralysed muscles, with abolition of their reaction to the Faradaic current. The affection is almost peculiar to childhood.

Symptoms.—In some cases the disease begins with appalling suddenness; the child, if old enough to walk, falls down whilst crossing the room, and cannot get up. It is then found that one or both legs are paralysed. Sometimes the discovery is made in the early morning, nothing having occurred during the night to attract the attention of the nurse, or the child may have been restless and feverish. Sometimes it follows in the wake of one of the exanthemata, or appears to be the consequence of an accident. In some cases it is preceded by a definite illness of one or more days' duration, in which no symptoms calculated to raise alarm are observed; and just as the child seems to be getting well it is found that one leg or one arm is not being used. In very young children convulsions are often present in this premonitory illness; and in cases where all the limbs have been paralysed, the symptoms have sometimes resembled those of meningitis.

The paralysis is absolute and complete from the first; that is to say, it never spreads, though it is usual for it to become less marked in the course of a few days. The leg is more often affected than the arm, in the former the tibialis

anticus and extensor group of muscles being most commonly picked out; in the latter, the deltoid, the quadriceps adductors and glutei are less often attacked, the hamstrings not infrequently escaping. Both legs are more often attacked than an arm and a leg, whilst it is decidedly rare to see both arms alone affected, but not very uncommon to find the paralysis attacking both legs and one arm. Even when it seems quite general at first, it rarely remains so. It is believed that the muscles of the scalp, eyeballs, ears, pharynx, larynx, and the sphincters of the rectum and bladder always escape, and the cranial nerves are hardly ever the seat of the disease. Sensibility is never impaired, but the superficial and deep reflexes are at once lost. Some degree of pain and tenderness, especially in the neighbourhood of the joints of the paralysed limb, is common, and may persist, even for a month, in a gradually diminishing degree, but, as a rule, no pain is complained of whilst the child is undisturbed.

Usually in the course of a couple of weeks it is seen that the muscles are not only very flabby, but also that they are wasting, and that the limb is distinctly thinner than the other. This atrophy proceeds rapidly, and if the paralysed muscles be tested electrically, it will be found that they do not react to the induced current, but act normally, or even excessively, to the constant current (the reaction of degeneration). This change is usually present as early as the end of the first week. The blood-vessels of the affected part are contracted, and consequently the limb is always colder than its fellow, and has a somewhat livid colour, but no nutritive disturbances of the skin occur.

In long-standing cases the whole nutrition of the limb will be found to have suffered, and in consequence it is smaller in all its dimensions, the arrest of the growth of the bone being sometimes quite out of proportion to the extent of the muscular paralysis. After a time contractures are very apt to occur, not, as was formerly supposed, owing to the action of the unopposed healthy muscles, but from the influence of pressure or the weight of the body; of these, talipes equinus and equino-varus are the best examples.

There is a certain tendency to spontaneous recovery, but, unfortunately, it never proceeds very far. It is rare for a limb not to show some sign of improvement in the course of the first few weeks;

it is still more rare for anything approaching complete recovery to take place spontaneously. All the fibres are not paralysed in an affected muscle, and the chances of recovery depend on the possibility or otherwise of developing the healthy fibres. In too many instances for it to be a mere coincidence, it has happened that when the patient has reached adult life, he has become the subject of progressive muscular atrophy, but the cause of this sequence is quite unknown.

Diagnosis.—Until the paralysis is declared it may be impossible even to surmise the nature of the affection. In the early stages, hip disease, the so-called congenital dislocation of the hip, and syphilitic epiphysitis of the head of the humerus or femur, are the affections which might give rise to a similar set of symptoms. The obvious pain, heat, and swelling in the neighbourhood of the joint would show the true nature of the malady, whilst in regard to congenital dislocation the amount of wasting would have to be taken into consideration; if this were inconsiderable the probabilities would be in favour of the congenital affection. When rickets especially affects the muscular system, the condition of the legs may present some resemblance to infantile paralysis, but a very slight amount of care will suffice for the recognition of points of difference. If the paralysis be of hemiplegic form, it is probably of cerebral origin, and this will be confirmed if it be found that the reflexes are present, that the wasting is only slight, and that there is a tendency to rigidity of the muscles. In all cases the reaction of the paralysed muscles to the induced current should be ascertained, and it may be necessary to resort to the use of chloroform for this purpose.

Pathology.—Changes in the anterior cornua of the grey matter of the spinal cord, the exact nature of which in their earliest stages is unknown, are the cause of the paralysis and muscular wasting. The ultimate result is shrinking and degeneration of the multipolar cells, with gradual disappearance of their processes, and often of the remains of the cell. The neuroglia also, especially in the immediate neighbourhood, shows an increase of fibrous tissue; wasting, and sometimes fatty degeneration of the nerve tubes, is found in the anterior roots. To the naked eye the only change will be a slight paleness, or a dull pink colour, of the grey matter, and in long-

standing cases the entire cornu, or possibly the half of the cord, will be wasted. These changes are found in the lumbar or cervical enlargement according as the legs or arms were affected. In some cases, fatal at an early period, the damaged area of the cord has been found soft and vascular, pointing to the presence of inflammatory action, but whether the inflammation begins in the motor cells or in the neuroglia has not yet been determined. In others, the appearances have suggested that a small hæmorrhage has occurred, a mode of onset that would fit in well with the symptoms sometimes observed. The muscles at first appear simply wasted, they then lose their striation, and finally undergo degeneration. In long-standing cases, atrophy of the paracentral lobule in the opposite cerebral hemisphere has been found.

Ætiology.—The disease may occur at almost any age, but is most common between the sixth and eighteenth month. Boys and girls seem equally liable to it. It occurs much more frequently during the summer months, perhaps because at this time less care is taken to protect children from the effects of a chill, but little is definitely known about the exciting causes. The disease has sometimes followed an injury, and occasionally it has come on during convalescence from one of the exanthemata. Robust children, equally with the weakly, are liable to be attacked, nor does inherited neurotic tendency seem to predispose especially to the affection. It has been suggested that the careless way in which children are lifted by the arm may be a cause, but the obvious reply is that the leg is much more often affected than the arm. The disease is not more common amongst the children of the poor than those of the wealthy.

Treatment.—During the acute stage—*i.e.*, for the first week or so after the paralysis is discovered—the child should be kept quiet; and some recommend that it should not be allowed to lie on its back, with a view to diminish any tendency to congestion of the cord. A succession of blisters applied to the spine near the seat of the disease is a form of treatment which experience has proved to be more efficient than any other. If there be no fever, ordinary diet may be allowed, and internally the liquid extract of ergot in 3-minim doses, tincture of belladonna or liquor strychninæ in 1 or 2 minim doses, or 1-grain doses of iodide of potassium, may be given to an infant twelve months old. At the end

of a month no further improvement can be looked for on these lines, and cod-liver oil and iron should be used instead. After the first week the child should be taken out every day, if the weather permit, and as soon as the limb can be freely handled without pain, which will often not be until after the lapse of three or four weeks, systematic massage and the use of electricity should be commenced (see the articles under these headings). By these means we may hope to develop the muscular fibres of which the nervous centres are not destroyed, but are merely inactive from disuse, and to maintain the circulation in the paralysed muscles. From the first the greatest care must be taken to keep the limb warm. It is never too late to commence this treatment, though of course the earlier it is begun the better the prospect, but even when two or more years have been allowed to elapse, persistent treatment has been very successful. A case should not be given up as hopeless until after at least a year of systematic treatment. Every effort should be made to overcome deformities by manipulation, and by the use of instruments; if these measures fail, the aid of the surgeon should be sought.

JOHN ABERCROMBIE.

INFLAMMATION.—Inflammation is a process which is very difficult to define in the present state of our knowledge. Dr. Burdon Sanderson has given the following definition: "The succession of changes which occurs in a living tissue when it is injured; provided that the injury is not of such degree as at once to destroy its structure and vitality." Lately, owing to the observations of Mentschikoff, some authorities consider the succession of changes as "the method by which an organism attempts to render inert noxious elements introduced from without or arising within" (Bland Sutton).

From time immemorial inflammation has been considered the most important phenomenon in disease. Medical terminology indicates how closely inflammation is associated with nearly all morbid processes, and it is not too much to say, that a correct understanding of the pathology of inflammation, is the foundation of all medical and surgical knowledge and the key to the scientific treatment of disease.

The four cardinal symptoms of inflammation—*calor, dolor, tumor, rubor*—were enunciated by Celsus; to these may be added *functio laesa*. Galen explained

the redness by an increased flow of blood to the part, and the swelling he attributed to exudation.

Little was added to our knowledge until the time of John Hunter: many of the principles of the pathology of inflammation held by him are now proved to be true. The cellular theory of pathology of Virchow, led to the adoption of erroneous views as to the origin of pus corpuscles, the most important being a belief that they arose by multiplication of the fixed connective-tissue corpuscles. Serious objection was raised to this theory by Addison and Waller, both of whom observed and recorded the fact, that the white corpuscles migrated from the blood-vessels in large numbers in an inflamed tissue, and moreover, they expressed the belief that the migrated leucocytes became pus corpuscles.

The honour of establishing the modern theory of inflammation is entirely due to Cohnheim, who by a careful series of microscopical observations, elucidated the succession of changes which occur in an inflamed tissue. He used the mesentery, the web of the foot and the tongue of the frog. The inferences he drew from his observations have been proved to hold good when applied to warm-blooded animals, for similar changes have been described in the bat's wing, in the mesentery of dogs and rabbits, and even in the human lip, when these structures are injured.

With this brief introduction we shall now consider the microscopical changes which occur in an inflamed tissue; for convenience sake they may be considered separately under three main headings, but it must be clearly understood that they occur conjointly, even from the very onset of inflammation.

I. Vascular Changes.—All tissues are extra-vascular, the abundance of the blood supply depending upon their functional activity, consequently tissues having a purely mechanical function, are supplied with few vessels or derive their nutriment from vessels which are not situated in the tissue itself, but in the immediate neighbourhood. These so-called non-vascular structures are the cornea, cartilage, and elastic tissue; they are, however, capable of undergoing inflammation, and the vascular changes can be observed in the circumjacent vessels.

If the mesentery of a brainless, curarized frog, be examined under the microscope, the process of inflammation can be readily studied. After 15 to 20 minutes

simple exposure to the air induces inflammation, manifested first by *dilatation of the arteries*, then of the veins, and lastly and to a much less degree, of the capillaries. With the general vascular dilatation occurs also an acceleration of the blood stream, the so-called afflux or determination of blood to an injured part. The acceleration does not last long, and is followed by a very marked slowing or *retardation* of the circulation. The vessels remain dilated, and numbers of capillaries which previously were not seen, now become visible, the small arterioles exhibit *pulsation* and each individual corpuscle in the smaller vessels can be distinctly recognized.

At the commencement of the observation, it is noticed that the blood in the vessels exhibits a central axial stream containing the corpuscles and a periaxial stream of plasma. It has been proved experimentally, that when fluids containing particles of different specific weights be forced through tubes, if the rate of flow on the one hand be sufficiently rapid, the solid particles will form an axial stream, and the fluid, the periaxial stream; if the rapidity of flow on the other hand be diminished, the lighter particles will be thrown out into the periaxial stream. This seems to explain the change which occurs in the periaxial stream of the vessels, for as the circulation gets slower in the inflamed mesentery, so the white corpuscles, which are specifically lighter than the red, are seen collecting in increasing numbers in the periaxial stream of the smaller veins, forming a continuous layer one or two rows deep, like an epithelial lining.

After a time the flow has become so slow in the capillaries that only an occasional *oscillation* is seen synchronous with the pulse, eventually culminating in *capillary stasis*; finally, coagulation of the blood in the vessels leads to thrombosis, although it seems that after stasis has occurred the blood may remain fluid for several days.

II. Exudation of Fluid and Escape of Blood-corpuscles.—The leucocytes, which in proportion to the slowing of the circulation have been accumulating in the periaxial stream of the veins, commence to *migrate*. The process is termed *diapedesis*.

A white corpuscle, if watched, will be noticed to bulge out the vessel wall laterally; after a short time it will have made its way through the wall, and it will now hang like a little pear-shaped mass with its stalk attached to the vessel

wall: eventually this is sundered and the corpuscle is free to wander in the tissues. Great numbers of white corpuscles escape in this way, usually many more than the red, but the latter escape in great abundance if the injury be severe. Leucocytes migrate from the capillaries as well as the veins.

An escape of fluid from the vessels is always taking place, even in health, but in inflammation not merely is the transudation increased in quantity, but it is changed in quality, it is richer in albumin and capable of coagulation. In fact after a short time a *false membrane* can be removed from the surface of the mesentery.

III. Tissue Changes.—These are not so readily observed in an inflamed area as the vascular changes. They depend upon several conditions—firstly, upon the direct effects of injury; secondly, upon the pressure exerted upon the tissue elements by the exudation products; and thirdly, upon disturbance of the circulation and nutrition.

The tissues of an inflamed part are softer, owing to the structural element being separated by the fluid exudation, and the lymph spaces are crowded with leucocytes, and perhaps red corpuscles. The ultimate degree of destruction of tissue elements mostly depends upon the degree of re-establishment of the circulation in an inflamed area.

Regenerative processes may occur in the neighbouring cells of an inflamed area, by which the tissue may be repaired. This is a process of cell multiplication, but Sinfleben has shown that it occurs independently of inflammation. Moreover, tissue repair by cell multiplication on the one hand, and intensity of inflammation on the other, proceed in an inverse ratio.

The Cardinal Signs of Inflammation are—

(1) *Rubor (Redness)*.—This depends upon the increased afflux or determination of blood to the injured part. Frequently, owing to dilatation, numbers of vessels hitherto unseen become visible; this is termed *injection*. If the vessels are not recognizable, as in inflammation of the skin, the redness is *diffuse*. The redness is usually of a dark tint, tending even to purple; this is owing to the blood being contained more in the veins, and also to the slowing of the blood stream by which the corpuscles contain less oxyhæmoglobin.

The redness depends also upon two other conditions viz., capillary stasis

and the escape of red corpuscles. Either of these conditions produces redness, which will not disappear on pressure. Hæmorrhages frequently give it a *punctiform* appearance. Much transudation will diminish the degree of redness, therefore the sign "rubor" is often most marked in the earlier stages of inflammation.

(2) *Tumor (Swelling)*.—This is caused by two factors, *vascular turgescence* and *exudation*, the latter being much the more important.

There is a great increase of exudation from the vessels in inflammation, and this leads to an increase of the lymph stream. Swelling of the part occurs if the ratio of absorption by the lymph channels be not proportional to the increased exudation, and the degree of swelling depends upon the relation of these two factors. This exudation is not due to resistance to the flow of blood through the vessels as in venous obstruction, because we know that actually a larger flow of blood through the veins occurs in an inflamed part. Neither is it due to increased pressure in the vessels, but it is owing to *damage of the vessel wall*, which is the essential lesion of inflammation. In proportion to the injury the vessel wall loses its power of resistance to the passage of fluid and corpuscles. As Cohnheim puts it, alteration of the filter not only allows of quantitative changes in the filtrate, but also a very important qualitative change.

Inflammatory lymph has a higher sp. gr., contains more albumin, and more white corpuscles; it has, consequently, a greater tendency to coagulation than the exudation from venous obstruction. This proves that the vessel leaks in a different manner in the two cases. In severe forms of inflammation, especially when occurring in very vascular structures—*e.g.*, the lungs, the kidneys, and the heart—there may be an extensive escape of red corpuscles, giving rise to *hæmorrhagic exudation*.

The extent and form of swelling which may occur in an inflamed part greatly depend upon the anatomical structure. The exudation occurs primarily into the connective tissues surrounding the vessels, and if absorption does not take place, it will accumulate in the inflamed area, and will naturally travel along the lines of least resistance. In pneumonia it accumulates in the air-sacs. Inflammation of serous membranes and joints is attended with exudation into the serous cavities. Inflammation of the

vagina, nose, respiratory tract, alimentary canal, bladder, and kidneys, may be attended by little or no swelling, owing to the free exit which the inflammatory exudation products find from the body. We therefore see that although swelling has for its origin but one cause, yet in the mode of its appearance it is one of the most variable of signs.

(3) *Dolor (Pain)*.—The degree and intensity of the pain depends upon the *abundance of the sensory nerves* in the affected part, the *capability of distension* of the organ or tissue, by the exudation, and, lastly, upon the *amount of exudation*.

In organs which contain but few sensory nerves, *e.g.*, the kidneys, severe inflammation may occur without much pain. In periostitis, owing to the difficulty the exudation has in accommodating itself, the pressure upon the sensory nerves is great and the pain intense. The character of the pain varies considerably; often it is throbbing. This depends upon the increased pressure on the sensory nerves produced by the pulse wave in the affected part. When the part is dependent, an increase of the affluent blood is favoured by gravity, and the effluent stream is retarded, conditions which favour exudation and thus account for the increased pain. Pain must, however, be considered conservative, for it tends to curative measures, such as rest, &c. Inflammation of structures in which the sensory nerves have lost their function, or have been destroyed, are usually attended with disastrous results.

There is a general belief in the existence of trophic nerves, and physiologists teach that there are two sets of nerves presiding over the nutrition of tissues, viz., katabolic and anabolic, the former controlling destructive metabolism, the latter constructive. Whether we explain the following pathological facts by the theory that trophic fibres exist in nerves, or rather believe that they only show the truth of the statement that structures deprived of their sensory nerves are more prone to inflammation, it matters not. Injury to the fifth nerve leads to sloughing of the cornea; herpes zoster follows neuritis, and bed-sores occur after injury of the brain or spinal cord; rarefying osteitis may follow injury of nerve roots.

(4) *Calor (Heat)*.—An inflamed part feels hot to the patient, but as John Hunter pointed out, the temperature is never really above that of the rectum, or of the blood generally. If there were actually more heat produced in an in-

flamed part, its temperature would not be raised on this account, because the heat would be distributed over the whole mass of blood in the body.

If inflammation be produced experimentally in the foot of an animal, the temperature of the inflamed part will be a little higher than the corresponding member of the other side, but this may be explained by the increased afflux of blood. In unilateral pleurisy in rabbits, the temperature of the inflamed cavity is never above and is usually below the healthy one. Consequently, the slight increase of temperature in the former case is due to the increased flow of blood to the part. The burning feeling may be explained by the fine degree of appreciation for slight variations of temperature in the blood circulating in the skin of the inflamed part possessed by the sensory nerves, when contrasted with the sensations from the surrounding healthy structures.

Punctio Læsa.—Impairment or loss of function of an inflamed part may be added to the four cardinal symptoms.

Glands may be unable to secrete, muscles to contract, nerves to conduct, and other structures to perform their functions, or, at any rate, to perform them in a normal manner. This may be temporary or permanent according to the severity of the inflammation and the nature of the tissue. The highly differentiated tissues of the central nervous system are incapable of regeneration.

Varieties of Inflammation.—The essential lesion of inflammation is damage to the vessel walls. The extent of injury will determine both the amount and characters of the exudation and the number of corpuscles, both red and white, which will escape.

The varieties of inflammation may be said to depend upon three factors. (1) *The nature and intensity of action of the noxious agent.* (2) *The duration of its action.* (3) *The anatomical structure of the inflamed tissue.*

The following varieties depend upon the nature of the exudation products:—

(1) *Serous Inflammation.*—The injury is slight; as a result, the exudation, although it contains more albumin than a passive transudation, nevertheless, owing to its not containing many leucocytes, does not coagulate, or, at any rate, only flakes of fibrin are formed. The best examples are afforded by chronic effusions into serous cavities—*e.g.*, the pleura and joints. When it infiltrates the substance of a solid organ or struc-

ture, it gives rise to *inflammatory edema*. In impoverished conditions of the blood, even if the inflammation be comparatively severe, the exudation may be serous in character.

When a *mucous membrane* is mildly inflamed, the exudation escapes from the surface, and such a condition is termed *serous catarrh*.

(2) *Sero-Fibrinous.*—This condition arises when the injury, although more severe than the above, is less so than the following form. The exudation is fluid, but contains a very considerable quantity of fibrinous flakes.

(3) *Fibrinous or Croupous.*—Typical examples are afforded by the serous membranes—pleura, peritoneum, pericardium—and mucous membranes. The exudation contains large numbers of white corpuscles, and the fluid is rich in fibrinogen, consequently it tends to form fibrinous layers on the surface of the inflamed membranes. The meshwork of fibrin encloses numbers of leucocytes, and this constitutes “lymph.” An adjacent serous surface may get coated with similar lymph, and the two uniting form an *adhesion*. This, by organization, may become transformed into connective tissue, which, later on, will contract.

The red corpuscles are usually few in number, because they remain around the vessels from which they have escaped; but in croupous pneumonia, owing to the proximity of the alveoli to the inflamed vessels, the exudation contains large numbers of red corpuscles. Croupous membranes may be formed upon inflamed mucous surfaces. They consist of an interlacing meshwork of fibrin enclosing leucocytes, or pus corpuscles, *e.g.*, plastic bronchitis and laryngitis.

(4) *Purulent or Fibrino-Purulent.*—In nearly all cases the inflammation is infective, micro-organisms being present. The exudation consists of a liquid plasma containing *pus corpuscles*. When a cavity is formed by the destruction and dissolution of the inflamed tissues, the cavity being occupied by pus, an *abscess* results. If the tissue destruction be superficial, and the part in which there is a solution of continuity of tissues secrete pus, we have an *ulcer*. A fibrino-purulent exudation is a condition in which the pus contains flakes of fibrin.

Pus is a thick creamy opaque yellow, or whitish-yellow fluid, of sp. gr. 1030–1033, and alkaline reaction; it is slightly viscid and possesses a faint odour. It does not coagulate spontaneously, although containing a very considerable

quantity of albumin. That pus, which is a derivative of the blood, should remain fluid, can be best explained by assuming that the micrococci and staphylococci found in pus have a peptonizing action upon the plasma.

Pus contains 10-15 per cent. of solid matter, of which two-thirds are albumin and the remainder salts and fatty matters. If pus be allowed to stand it separates into a yellow layer of pus corpuscles and a supernatant liquid, *liquor puris*.

Pus-corpuscles are leucocytes which have undergone a process of degeneration. As a rule they have no power of amoeboid movement, but are spherical masses of granular protoplasm, containing a nucleus, often showing indications of division into two or three nuclei. By the addition of acetic acid the nucleus is rendered more evident, the surrounding cell substance clearing up.

(5) *Hemorrhagic Exudation*.—When the exudation contains a sufficient number of red blood corpuscles to be apparent to the naked eye, the indication is either that there is a loss of vital resistance in the vessels, due to some constitutional disease or defect, *e.g.*, diabetes, hydræmia, &c., or a very intense action of the noxious agent which has led to the inflammatory process and the consequent damage to the vessel walls.

(6) *Putrid or Gangrenous*.—When the exudation undergoes putrefaction from the action of bacteria, the inflammation is very severe and the tissue destruction great. The colour of the diseased part may be grey, greenish or purplish-black, due to chemical changes. Gases may collect in the tissues, or escape, giving rise to foul odours.

(7) *For Diphtheritic Exudation, see DIPHTHERIA*.

Any tissue in the body, with the exception of a few epidermoid structures, may be the seat of an inflammation.

Varieties of Inflammation according to Anatomical Structure of the Tissues.—*Superficial*.—An inflammation of a free surface such as the mucous membranes, serous membranes, or the skin, is termed superficial. In this form the exudation either escapes from the body, collects in a space or cavity, or undergoes deposition on the inflamed surface.

Parenchymatous.—This term is applied to an inflammation of solid organs, such as the lung, kidney, or liver. The exuded liquid collects in the lymph spaces of the tissues and gives rise to an *infiltration*.

The process may be acute or chronic; as a rule the inflammation is intense and the essential elements of the organ exhibit morbid changes from the onset of the process, thus differing from the next variety.

Interstitial.—This form of inflammation is much more frequently a chronic process, although it may occasionally be acute. The changes are limited to the fibrous tissue framework of the organ, and the essential elements do not suffer until later on in the disease.

It is usually a question of degree rather than of difference in the process, and the distinction applies especially to certain organs, where the fibrous framework is well differentiated from the essential cell elements, *e.g.*, the liver, lungs, and kidneys.

The results of inflammation are:—(1) Resolution, (2) Suppuration with discharge or caseation, (3) Regeneration, (4) Formation of granulation tissue, (5) Cicatrization.

(1) *Resolution*.—If the inflammation be not severe, and the injurious agent does not continue in operation, the damaged vessel wall recovers, the circulation is renewed, and the exudation products are absorbed by the lymphatics.

(2) *Suppuration*.—If on the other hand the injury to the vessel be severe, and pus have formed, giving rise either to an abscess or a purulent exudation, one of two events may happen: the pus may be discharged, leaving the abscess cavity to be filled up by tissue regeneration, or the pus may undergo changes which eventually lead to the formation of a cheesy mass (*caseation*), and later this may become *cretaceous*. Generally speaking, such a substance acts as a foreign body and gives rise to productive inflammation in the adjacent tissues by which means it becomes encapsuled.

(3) *Regeneration*.—Repair is effected by the multiplication of the surrounding healthy tissue elements. Epithelium produces new cells by division, muscle forms fresh fibres and periosteum new bone. The ganglia of the central nervous system cannot however undergo regeneration after destruction, probably on account of differentiation of function of these master tissue elements.

Ætiology.—The causes of inflammation may be considered under two main headings; (1) *Intrinsic* or *predisposing* and (2) *extrinsic* or *exciting*. The former is a variable factor in every tissue or organ and in every individual. It is an unknown factor in every human being,

depending upon the family antecedents and the past life of the individual, and is perhaps more important to the physician than the extrinsic or exciting cause.

The causes with which the physician has to deal are often insidious and obscure. As a rule the exciting agent is only a part of the cause, *e.g.*, the morbid inflammatory conditions which arise in gout. The cause has been in operation for years, and it is generally only when it is far advanced and gives rise to pain that the physician is consulted.

Idiopathic inflammations are more and more regarded with suspicion as to their existence, pericarditis and pleurisy are often said to be idiopathic in origin. Cold and exposure to wet, such as by immersion, undoubtedly do produce inflammation of serous membranes; more frequently, however, it is the individual whose tissues have a predisposition to inflammatory affections of these structures, owing to a rheumatic or some other taint.

Peritonitis again is often said to arise idiopathically, most of these cases, however, are secondary to inflammation elsewhere. Females infected with gonorrhœa may die of peritonitis by extension of the infective inflammation along the Fallopian tubes: such cases may be misunderstood and termed idiopathic.

We shall only here briefly attempt to indicate the more important *exciting causes* of inflammation. They may be classified as follows:

(1) *Physical*.—Heat, burns, scalds, exposure to the sun, cold, exposure to damp, immersion. The latter are among the most common exciting causes of inflammation of the viscera and serous membranes.

(2) *Mechanical*.—Direct injury, wounds, contusions, fractures. The following are, however, some of the more important causes with which the physician has to deal:—Improperly masticated food and indigestible food may set up gastritis; the inhalation of irritant particles into the lungs will produce pulmonary fibrosis, a disease common amongst miners, millers, and knife-grinders.

Inflammation may be due to parasites affecting the skin (*acarus*), the muscles (*trichina*) and the viscera (*hydatids*). Frequently in such cases the inflammation may be sanative, the parasite becoming encapsuled by the inflammatory product. Again, strain combined with defective nutrition plays a most important part in cardio-muscular inflammation and subsequent degeneration.

(3) *Chemical*.—We may divide these causes into two classes: local, as in the bite of an insect, owing to the irritation produced by formic acid; or, again, the application of irritating or corrosive fluids to delicate structures. The most important chemical excitants of inflammation are those which, owing either to defective elimination of waste products from the system, or to the circulation in the blood of poisons such as alcohol and lead, give rise to chronic inflammatory changes around the small vessels, and subsequently to the production of fibrous tissue and atrophy of the essential elements of the organ. The effect produced by the poison is particularly marked in those organs where the irritant is most concentrated—*e.g.*, cirrhosis of the liver in chronic alcoholism, and cirrhosis of the kidney in retention of imperfectly oxidized nitrogenous waste matters.

Many poisons when taken into the system tend to produce local inflammation—mercury causes stomatitis; cantharides, nephritis; potassium iodide affects the mucous membranes. These effects may be explained by the elimination of considerable quantities of the drug by these structures.

The above causes all tend to produce simple inflammation, that is to say, if the cause be removed, the inflammation will subside, or at least it will not progressively increase.

(4) *Infective Causes which depend upon the Action of Living Organisms*.—Prof. Hüter, asserted that inflammation could not occur without micro-organisms. Most authorities believe that true creamy pus can only be formed when micro-organisms are present, and no one doubts that in most cases suppurative inflammation is the direct result of the action of micro-organisms, particularly micrococci, which by their peptonizing action prevent the formation of fibrin. A simple inflammation may become suppurative owing to infection—*e.g.*, simple endocarditis becomes ulcerative and may give rise to a condition like pyæmia; this has been proved to be due to the presence of micrococci in the vegetations.

There are two main groups of factors in the production of an infective inflammation; they are, the *nature and the number of germs introduced, and the soil*.

The mode of production of inflammation by germs varies considerably. They may produce a local inflammation, which may or may not become general, or they may from the outset produce a general

inflammatory process, but usually they then attack some particular structures more especially.

The micro-organisms may be specific or non-specific, the former are especially prone to attack certain tissues in preference to others—*e.g.*, the bacilli of anthrax attack the spleen; those of lepra, the skin; and the bacillus of tubercle affects particularly the lymphatics of internal organs.

The inflammation which is excited by micro-organisms is probably due to the fact that they multiply wherever they find a suitable nidus, and act as foreign bodies, setting up local inflammatory processes. These foci, owing to the dissemination of the germs by the blood and lymph streams, may be innumerable, as in general tuberculosis. During their growth and multiplication various chemical products originate, and these play a very important part, as we have already seen in the formation of pus.

The soil is of almost as much importance as the number and nature of the germs.

In general non-specific inflammations we know that they are much more likely to be suppurative if the vital resistance of the tissues of the body has been lowered, as, for example, by alcoholism, chronic Bright's disease, diabetes, and malnutrition. Moreover, it has been shown that animals suffering from inflammation artificially produced, when fed upon putrid meat, become affected with an infective suppurative inflammation.

Again, the influence of soil is strikingly shown in the hereditary tendency of certain races and individuals to particular specific inflammations. Among animals also we have a remarkable instance of hereditary immunity in the Algerian sheep, which cannot be inoculated with anthrax.

Latterly, Mentschikoff and others have shown that the white corpuscles of the blood are the essential agents in the destruction of micro-organisms. Direct observations prove this; moreover, we know that in suppurative inflammation and in tuberculosis the white corpuscles are greatly increased in number.

It is concluded that the white corpuscles migrate from the vessels in inflammation, for the purpose of removing the living or dead matter which is either the cause or the result of the inflammatory process. Mentschikoff has also demonstrated that the leucocytes may be observed in the tadpole's tail devouring

the useless tissues, and their protoplasm may be seen to be loaded with the debris. Moreover, he has observed the process of ingestion of bacilli and other micro-organisms by the white corpuscles. These observations tend to show that an essential part of the process of inflammation is a struggle between the leucocytes and foreign matter, whether it be dead or living.

In the case of simple inflammation the white corpuscles have merely to remove the products of tissue-death and disintegration. In the case of a local infective inflammation they have to engage in a death-struggle with the micro-organisms. If the leucocytes be victorious, the local suppurative inflammation terminates in an abscess, which may discharge its contents or dry up and become encapsuled. On the other hand, should the leucocytes be unequal to cope with the micro-organisms, on account of their own inherent low vitality, or on account of the number and virulent potentiality of the germs, then the infective process will become general.

F. W. MOTT.

INFLUENZA.—A specific epidemic disease, sometimes marked by catarrh of the naso-pharyngeal and pulmonary mucous membrane.

Symptoms.—The onset of illness is always sudden, and is marked by chilliness or actual shivering. From an early period there is marked prostration, the patient feels faint and giddy, he is sometimes drowsy, and may fall suddenly down. Sneezing, followed by a watery discharge from the nostrils, may be an early symptom; the eyes are red and watery; the fauces are also red. The fever is high at first, and the skin dry, but, in a mild case, it soon becomes moist; the pulse is rapid and small. Cough, either hard and dry or with a little secretion, is usually present; with this there may be some rhonchus and sibilus. There is complete anorexia and nausea, and loss of taste. Severe headache and a pain in the eyes are almost always present. Severe pains, especially in the back, chest and limbs, may constitute the most prominent features, all catarrhal symptoms being absent. The urine is scanty and high-coloured. The above is a description of a mild attack, such as usually lasts from three to five days.

The case may be more severe owing to an exaggeration of any of the symptoms, and any imprudence during convalescence may be followed by a relapse in

which, instead of simple bronchial catarrh, there may be capillary bronchitis or broncho-pneumonia. Gastric symptoms may predominate, and there may be constant sickness, and perhaps jaundice, with diarrhoea and blood-stained motions.

As a rule, recovery is complete; but in those who are predisposed to that affection an attack may be the starting-point of pulmonary tuberculosis. The aged and the very young often succumb to the lung complications, but in the case of an adult in good health an attack rarely gives any occasion for alarm. One attack affords no protection against subsequent infection.

There are no characteristic post-mortem appearances.

Etiology.—Influenza presents one of the most typical examples of an epidemic disease, and its spread is at times so rapid that in a very short period a large proportion of the inhabitants of a town or district may become affected. According to Hersch, in the great pandemics of 1833 and 1837, "many countries were smitten by the disease as if at one blow." In the first two months of the year 1833 the disease is said to have spread all over Russia; "in March it appeared in Poland, Bohemia, Northern Germany, Egypt, and Syria; in April it began to prevail in Austria; Hungary, France, Great Britain and Ireland; Tyrol, Dalmatia and Italy suffered in May, the Netherlands in June." Dr. Peacock states that more than one quarter of the whole population of London suffered during the epidemic of 1847-48. In Paris at that period the proportion is said to have been nearly one-half. Russia has been the starting-point of the disease in all the great pandemics, and in 1889 an epidemic, originating in St. Petersburg, spread to nearly all parts of Europe, and to America and elsewhere.

During the epidemic prevalence of the disease in any country, a similar affection has been observed among animals, cats, dogs, cows, and especially horses, having been its chief victims.

There is no periodicity about the epidemics, and they occur quite independently of season, climate or soil. A thick black fog has occasionally been observed to precede an outbreak of the disease. An epidemic may travel with the wind or against it; at times the rate of spread of the disease is very rapid, at others very slow. Epidemics rapidly attain their height and quickly

subside. Insanitary surroundings probably favour an outbreak of the disease. Although direct contact is not essential, the disease is, to a certain extent, contagious. It does not appear sporadically. It is presumably due to some living organism transmitted by the air and capable of reproducing itself very rapidly in the air. This has lately been identified by Dr. Siefert, of Würzburg, and named the "influenza-coccus." The organism is stated by this observer to be present in the expectoration from all the cases of the disease. The incubation period may be exceedingly short or may last two or three weeks.

The disease is said to occur more readily in women than in men, and in men than in children.

Treatment.—The patient should be kept in bed or in a warm room until convalescence is complete. Lowering treatment is not well borne; antipyrin, quinine or salicin may be given in the febrile stage, with an occasional saline purge. Lung complications should be treated upon general principles. Great care in avoiding exposure to cold is essential at all stages of the disease.

JOHN ABERCROMBIE.

INHALATION.—It has been definitely proved that not only gases, but also liquids and even solids, can be made to enter the lungs by the process of inhalation, provided that none of these be of an irritant nature. In the case of solids and fluids it is likewise essential that they should be in a state of extremely fine division. Various remedial agents can thus be brought directly into contact with the mucous surfaces of the upper and lower air passages, and are capable of absorption into the general circulation, through the blood-vessels of the lungs. They may, therefore, have a local action upon the respiratory tract and a general action upon other organs. The influence of heat and cold may also be brought to bear directly upon the lungs by similar means.

Solids are rarely, if ever, employed by inhalation in lung affections, but are frequently used in the treatment of pharyngeal and laryngeal diseases. They are, however, much more effectively applied by insufflation through a straight or curved tube of glass or vulcanite, by which means they can be directed with accuracy upon the exact spot where they are required, without being distributed indiscriminately to all surrounding parts.

Liquids can only be inhaled when they are broken up into very fine spray. They can be employed at any temperature and may be found useful as a means of applying the influence of cold. Spray producers are in universal use and do not require special description. Two forms may be used for inhalation, the simple hand-ball spray producer and the steam apparatus on the principle of "Ziegler's spray."

The steam spray is best adapted for inhalation when it is desired to affect the larynx and bronchi, and to diffuse the medicament evenly over the mucous membrane.

The hand-ball spray producers are most useful in affections of the mouth, fauces, posterior nares or nostrils, where a local more than a general effect is desired. The spray may be directed through suitably curved tubes, of which Troeltsch's is at present one of the most practical forms. The liquids to be atomized by the hand sprays should be kept at a temperature of about 160°, as much heat is lost in the process of spraying.

In inhaling spray the lips must be widely separated, the tongue depressed and deep inspirations taken. The patient should be able to obtain a view of the whole of his pharynx before a mirror, and, until he can do this, inhalation of spray should not be attempted.

In using the steam spray inhalers it is advisable to collect the spray in a glass tube of about 1 inch in diameter and 4 inches in length. The end of this tube should be taken between the teeth, and the lips closed over it. The steam may then be freely inhaled without the annoyance of its diffusion over the rest of the face. Unless deep inspirations be taken, there is but little chance of the inhaled medicaments reaching the lower air-passages.

The position in which the patient sits is also of importance. The body should be fairly upright and the head slightly raised so as to render the angle formed by the mouth and the trachea as obtuse as possible.

Inhalation should always be practised in a room of equable temperature, and the patient should not leave the room for at least a quarter of an hour after the inhalation is concluded.

It is important that inhalation of medicated spray should not be practised for a long time without pauses for the respiration of fresh air. Four or five respirations in succession are quite

enough, and a pause should then follow of equal length.

Inclusive of these pauses, each sitting should not be prolonged for more than a quarter of an hour.

These observations may be taken to apply with equal force to the inhalation of medicated steam.

Gases and Vapours may be employed for inhalation either at the normal atmospheric pressure, or under increased or diminished pressure, and at any desired temperature. The simplest forms of inhaler for vapours at the ordinary atmospheric temperature are respirators, fitted with a small space in front capable of holding a piece of lint or of sponge on which the required drug can be poured. Volatile oils, ethers and spirits can best be inhaled in this way, but the inhalation must be long-continued and the apparatus so contrived as to cover both the mouth and the nostrils, and fitted with valves permitting the expired air to pass out of the inhaler without again coming into contact with the sponge.

The best form of inhaler for moist medicated vapour at a high temperature is that known as Mackenzie's "eclectic inhaler," by means of which a stream of air is drawn through medicated water of a fixed temperature, generally about 140° F., the mouthpiece being guarded by valves so that the same air cannot re-enter the inhaler after it has once passed out.

Steam, either medicated or plain, may be inhaled by means of Dr. Robert Lee's inhaler, in which the water is heated in a small spherical boiler, the steam escaping through a tiny pin-hole in the upper side. Two ounces of water are placed in the boiler, a few drops of the medicament to be inhaled are then added the top screwed firmly down, and the spirit-lamp placed underneath; steam will soon issue from the pin-hole with considerable force, and may be inhaled, with the precautions already indicated, through a glass tube of one-inch calibre. The metal tube generally supplied with this inhaler is apt to become too hot to be used with comfort.

A very simple inhaler for medicated steam can be constructed by placing the medicament in a medium-sized jug and pouring over it about half a pint of water at a temperature of 180° Fahr. The medicated steam arising out of the jug can be drawn into the mouth and nostrils very effectively by simply preventing its escape at the sides of the jug with the hands or by a folded towel.

Care must be taken, however, that not more than three inhalations are made in succession without a pause for the inhalation of fresh air.

These methods of inhalation are especially adapted where volatile oils have to be employed, a definite quantity of the oil being previously shaken up in a drachm of water containing $2\frac{1}{2}$ grains of light carbonate of magnesium.

In all forms of vapour inhalers where tubes are used it is important that they should be of wide calibre and that the nose should be closed, otherwise the inhalation may be reduced to a mere sucking process which will not carry the vapour beyond the mouth. Medicated cigars or cigarettes are sometimes used, and are undoubtedly of good effect in certain forms of spasmodic dyspnoea, but it is probable that their effect is due to direct absorption by the mucous membrane and not to any local action. In many instances the same drug given by the mouth has been shown to have an equally powerful effect.

Chambers have been devised to ensure the complete inhalation of medicated air, and consist essentially of small rooms or cabinets into which medicated vapour can be introduced, either as a spray or by suspension of cloths kept wet with the required solution, which is allowed to evaporate freely and is constantly renewed, or by an arrangement of fans blowing air through the medicated fluid directly into the chamber. By all these methods the air is not only medicated but also moistened. The volatile oils such as eucalyptol and creosote, or carbolic acid, can all be employed in this way, and have been found effective in many cases of chronic bronchitis and phthisis with much bronchial secretion. The want of fresh air in the inhalation chambers is apt to become more apparent to the patient than the presence of the medicated air, and feelings of suffocation, headache and nausea are sometimes complained of. To facilitate their entrance into the deeper parts of the lung, vapours are sometimes delivered under pressure, by means of inhalers constructed on the principle of the accordion, which can be compressed to any required degree; they are, however, but little used.

The *drugs* best suited for administration by inhalation are the following:—Local astringents for application to the pharynx and larynx may be applied in the form of spray. Such are tannic acid (gr. x-3j), chloride of zinc (gr. ij-3j), lactic

acid (℥xx-3j). Cocaine as a local anæsthetic may be used in spray of a strength of 6 per cent., or even stronger in severe cases.

Stimulant or sedative vapours are best used by means of oro-nasal inhalers or in the simple arrangement lately introduced by an American firm, in which the volatile substance to be inhaled is dropped into a tube, a part of which is packed with coarse pine wood sawdust. This absorbs the fluid, and permits of its slow evaporation, as the patient inhales through the other end of the tube, which is shaped for the purpose. The vapour of chloride of ammonium has been much employed of late years, but chiefly for affections of the posterior nares and Eustachian tubes.

Inhalers are now contrived by which the same act of suction draws the vapour of sal ammoniac and of hydrochloric acid from separate bottles, to meet together in a common receptacle from which the mouthpiece opens. The mixed gas is drawn through water contained in this receptacle, and is capable of further medication by adding any volatile substance to the water.

The volatile oils suitable for use in the moist vapour or steam inhalers, are pinol (℥iij-3j), creosote (℥j-3j), carbonic acid (20 grains to the pint), compound tincture of benzoin (1 drachm to a pint), conium (succus conii, 2 drachms to a pint). Iodoform, iodine or eucalyptol may be employed in small quantities in the simple respirator inhalers, a few drops of the following preparations being used for each inhalation:—R Ol. eucalypti, ʒijss; chloroformi, ℥xxxvj; sp. rect., ʒijss; iodoformi, gr. xv. R Iodi, gr. viijss; ætheris ʒss; ac. carbol., ʒss; creasoti, ʒijss; sp. rect., ʒij. R Ol. eucalypti, alcohol ethylic. aa part. æq.

In using the foregoing substances in the steam draught inhaler, it should be remembered that the more volatile the remedy the more essential is it that it be used directly the steam begins to come off freely. Such substances are apt to be volatilized very early, and hence the steam delivered during the first few minutes is of more importance than all that comes after. This fact is very apt to be forgotten in the routine of practice.

E. CLIFFORD BEALE.

INOCULATION is the introduction into the body of a morbid germ or poison by direct application to the subcutaneous or submucous tissues. It may be accidental or intentional. The *materies morbi*

may be introduced by being applied to an abraded surface or by subcutaneous injection. Some diseases are only communicable by inoculation, such are vaccination and acquired syphilis.

INSANITY.—This term comprises the various symptoms of disorder in the functions of that part of the nervous organization of man which is concerned in the production of the phenomena to which we give the name of "mind."

Insanity may be due to defective development, to acquired disease, or to the natural decay which is the fate of all organic structures.

This subject is of increasing importance, and every medical man must be prepared to deal with insanity in its clinical, social, and legal aspects. The legislature has recognised that insanity is a disease, and has enacted that certificates of insanity shall be given solely by medical men. Moreover, it has recognised that insanity differs from all other diseases in that it snaps the continuity of conscious existence, and creates for the time what for all practical purposes must be considered a new individual, and for the care of this exceptional individualism, the product of disordered brain action, it has passed special laws and overridden the most ancient and sacred rights of citizenship. Having entrusted medical men with such large powers, the State expects that due care shall be exercised, and neglect or ignorance on their part may render them liable to be mulct in damages. For the legal questions which concern him the reader is referred to the article, **LUNACY LAW**; the clinical and social aspects will be here considered.

Symptoms.—Leaving the symptoms of idiocy (*q. v.*) to be considered separately, we find that the first indication of insanity is a change in the character of the individual. Feelings of dulness, sadness, apathy, indifference, perplexity or confusion, or on the other hand a sense of buoyancy, unwonted activity or recklessness may be observed. Such conditions are common to all human beings, but in the case of the patient on the verge of insanity, they come on without due cause, and are totally foreign to his real nature. Thus, the cheerful and energetic may become moody and listless, and the placid restless and hilarious.

The actions soon correspond to the frame of mind, business is neglected, or rashly executed, the personal habits alter,

and the appetite becomes capricious, there is loss of sleep, and often a feeling of ill-health or of impending trouble.

This is the premonitory stage, and if rest and change of scene be provided, the attack may pass off, but will generally advance to well-established mental unsoundness. In the latter case we may find that from the feelings above-mentioned definite delusions have crystallized. For example, the patient may imagine that he has committed theft or murder, or that the venial sins of his youth are rising against him. He may imagine he is ruined, that his children are destined to be injured, or that his wife has turned against him or been unfaithful, or a thousand other ideas may dominate him.

The occurrence of hallucinations will render further progress towards an active form of melancholia easy and rapid. Visions may terrify him at night and voices insinuate the very facts of which he is most afraid. The anxiety about the bodily health may deepen to hypochondriasis, or the victim may fly to drink or seek distraction in objectless travel. The further progress of the case can be readily understood, the patient becomes violent and unmanageable, refuses his food, or threatens murder or suicide.

This is a gradually deepening melancholia, but the case may pursue a very different course. After a melancholic prelude of short duration, symptoms of excitement may supervene, and the further progress of the case is the same as if the first symptoms had been unnatural gaiety and activity. The patient indulges in all sorts of extravagances, spends money freely, takes to drink, becomes perhaps erotic and indecent, and occupies himself with fresh amusements or frivolous pursuits, and becomes quite indifferent to family and business affairs, or propounds the most absurd ideas upon these subjects. Definite delusions of wealth and grandeur, or of suspicion, mysterious agency and persecution may be developed. Many other symptoms will be described elsewhere, but the above will give a sufficient idea for the present of the two chief forms of insanity, melancholia and mania, of which there are many varieties.

The only other type which need be considered in the present connection is dementia or weak-mindedness, which is a factor in all cases of insanity, and is the chief feature in some alcoholic cases, in most cases of general paralysis, and in

all cases of senile and organic brain disease. Dementia is a weakening of the powers of memory, volition, judgment, reasoning, and of the association of ideas, it has been well called "the goal of all the insanities" and is fully described elsewhere. A variety of dementia, namely stupor, is a chief feature in some cases of melancholia, and may vary from mere apathy to catalepsy or a trance-like condition. General paralysis may begin with any of the above symptoms, but its most striking characteristics are the steady progress towards dementia, and the constant association of motor and mental weakness.

It is evident from the above description that insanity does not evolve any new and unnatural powers of mind, but either weakens those already existing, or brings into prominence unused potentialities of the individual brain. Alters the relationships of the various elements of mind, overthrows the balance which has hitherto been maintained, allows full liberty to tendencies which have previously been restrained, gives to the carefully concealed hopes, fears and wishes of a lifetime the reality of facts, and permits the appetites and passions to run riot to the detriment or absolute loss of the established affections.

No absolute distinction can be drawn between insanity and the many forms of temporary mental aberration. In the individual who gives way to overpowering passion, in the victim of hysteria, in the delirium of fever, and in the action upon the brain of alcohol and other tonic agents, we see conditions closely allied to the various forms of insanity. In the phenomena of sleep and of dreaming and in the actions of the hypnotised brain, we see temporary phases of mentalization which closely resemble mental conditions common among the insane. In dreaming, for example, self-control and all relation to time and space are lost, and impossible combinations of incongruous persons, events and opinions seem natural, but the personal identity is quite definite, and the same conditions are often observed in the acute forms of insanity.

Diagnosis.—The elements of diagnosis are a knowledge of the various forms of insanity and practical experience in dealing with the insane. For the guidance of those who have had little experience, some general considerations, sufficient for the establishment of mental unsoundness, are here discussed, but the accurate diagnosis between the various

forms is treated in the special articles dealing with each variety.

In the first place, great caution must be exercised in giving a decided opinion until the case develop, for in no department of medicine will a mistake be more readily discovered, or more deeply resented. Prior to seeing the patient, full information should be obtained as to the previous history, the family history, and the tastes and tendencies of the individual in question, and any changes in these latter must be carefully considered. Before the actual visit a general scheme of questions should be made out, and though each specialist will recommend his own method, it may be useful to suggest the most important subjects.

It is most desirable that the visit should be that of a doctor to a patient and, unless the case be exceptional it is well to have no misunderstanding on this point. It will thus be natural to begin by inquiring about the bodily health. The expression of face, and the condition of the pupils and tongue should be noted, and inquiries made as to the appetite and the relish for food. If any dislike for food exists the reason should be elicited, as hallucinations of smell or taste may exist, or delusions of obstruction to the passage of food, or the patient may believe he is commanded not to touch food, or that it is wrong to take it for various reasons.

It is well also to ask as to the condition of the bowels, and special inquiries about sleep and the existence of dreams are most important. If sleepless, the patient will generally after a time confess the cause. Noises in the ears, or actual voices, flashes of light, or visions, curious feelings about the body, such as electricity, or annoyance by people outside the house may be assigned as the cause, or simply pain in the head, uneasiness, or unhappy trains of thought.

The condition of the patient's dress, and the appearance of the room may afford indications. The domestic relationships may next be touched upon, any change in the affection for wife or children and any undue anxiety for their future noted. The business or profession of the patient will suggest a series of questions, his hopes or fears for the future may be elicited, and questions asked as to his relations with his neighbours. Finally, a few words may be said on the social, political or religious topics of the day, and if the condition of the memory be not already obvious it may be tested by a few simple questions.

At any part of the interview some hesitation, mental confusion, or incoherence may become apparent, or it may become obvious that the patient is concealing something. Slight contradiction or pretended misapprehension may then be necessary to break the slender bonds of self-control. When a hint has been obtained as to the line the mental unsoundness takes, it will often be advantageous not to follow the clue at once, but to recur to it at a later stage, when the patient's mind is occupied with other ideas. It is useful to force from the patient a confession that some change has come over him, to listen to his explanations of the change, and to suggest trivial causes which will be probably resented, and lead him to give full details.

Of course all this trouble may be quite unnecessary, if the patient be excited or violent, or incoherent, or in the condition described as "raving madness" by the older authors, the mere facts observed may be sufficient without a single question, but even here the actual words uttered should be given, and will always add considerably to the strength of a certificate. The possibility that the patient may be under the influence of drink, or of some narcotic or poison, or have been driven to his present condition by ill-usage, should never be lost sight of, but the ordinary knowledge of his profession possessed by every medical man ought to prevent the possibility of this error. It is important also to see some of the patient's recent letters and any bearing upon the mental condition should be kept, as they would form useful evidence if legal troubles should ever arise. The tests for mental capacity sufficient for the disposal of property, will be found in the article on LUNACY LAW (*q.v.*).

Prognosis. — Only general considerations can be mentioned here, and the reader is referred to the special articles on the various forms of insanity. As to age, the younger the patient the better the prognosis, but some adolescents present a strong tendency to secondary dementia. A short duration of the symptoms is decidedly a favourable characteristic, but if the symptoms continue unchanged for a year, the prognosis is bad, though a few cases, especially those of melancholia, recover after an attack of several years' duration. Persistence of hallucinations of hearing or smell, any tendency to periodicity in the symptoms, little disturbance of bodily function originally, or

improvement in bodily health without corresponding mental improvement, the absence of sufficient cause, and a dead stop after recovery up to a certain point, are all of ominous prognostic import.

On the other hand, an adequate cause, acute symptoms with much disturbance of the bodily functions, followed by a gradual convalescence, in which mental and bodily improvement go hand in hand, are all favourable characteristics.

The effect of the presence of neurotic inheritance on the prognosis is twofold: there is strong tendency to recovery, but an equally strong tendency to recurrence of the attacks. When the insanity is simply an exaggeration of previously existing eccentricity, the prognosis is bad, especially if the eccentricity be the result of neurotic inheritance.

Ætiology. — The causes of insanity are divided into predisposing and exciting, but many causes act in both ways.

The chief predisposing cause is neurotic inheritance. As knowledge grows, so does the certainty that we must look to the original constitution of the brain as the first and chief cause of mental breakdown. Not one of the ordinarily assigned causes are in themselves sufficient to bring on insanity. Such causes operate upon all human beings more or less, and it is not the brain which is subjected to the severest or most incessant action of the cause which breaks down, but the brain which is least fit to withstand the attack. Now, what we call neurotic inheritance, undeniably renders the brain more liable to be affected by these various causes, but the belief is becoming more general every day, that whether we can discover the fact of such inheritance or not, its existence, or the existence of a similar constitution of brain, is indisputable. For one man who breaks down mentally under the influence of drink, domestic troubles, or business worry, there are scores who under a precisely similar causation do not break down. The condition common to all mental disturbance is to be sought in inherent and inherited brain defect.

The influence of sex is slight and the excess of female lunatics under treatment is due to the much greater mortality among males, and the shorter period occupied by them in recovery. Some causes press more heavily upon, or affect only the male sex.

The influence of age is marked, the vast majority of the cases of occurring insanity fall between the ages of twenty-five and forty-five, the period of full de-

velopment of body and mind. The number of cases of insanity per 10,000 of population steadily increases to the age of twenty-five, and after forty-five as gradually decreases.

Insanity is much commoner among civilised than among barbarous nations. Poverty, insanitary surroundings, and privation, are all contributing causes. Congenitinity, or great difference in the ages of the parents, accidents during pregnancy, and birth, infantile convulsions, epilepsy, venereal excess, masturbation, nervous shock, the physiological crises of life, puberty, pregnancy, lactation, and the climacteric crisis, may all be mentioned as predisposing causes. But the cause which in its results to the individual and to his descendants ranks next to neurotic inheritance, is unquestionably drink, and it is probable that neurotic tendencies are created both in the individual and in the family by indulgence in alcohol.

Among the exciting causes we find some of those mentioned as predisposing causes, such as drink, epilepsy, pregnancy, and disorders peculiar to women, and to these may be added, injuries to the head, acute bodily diseases, such as fevers, diathetic disorders, such as gout or syphilis, anæmia and diseases of the blood-vessels, and special poisons such as lead.

Treatment.—The details of treatment must be sought elsewhere, only general principles can be discussed here. The cardinal principle is removal from old surroundings, and if this can be effected elsewhere than in asylums the friends will be grateful. But for acute cases, and the majority of all cases, asylum treatment affords the best chance of recovery, and the earlier the friends can be persuaded to take this view the better for the patient. Fresh air, abundance of food, light employment, and plenty of amusement, are main principles. The tonic effect which the indifference of the other patients has upon melancholics, and the absence of elements which attract the attention of the acutely maniacal, are not to be forgotten, and there can be no question that the patient suffers less in conforming to asylum discipline, which affects all alike, than when under surveillance in a private house, or in the home of which he was the active head.

Medicinal treatment is of little avail at first, sedatives should be sparingly used, but are imperative in some cases, and naturally are more frequently necessary in cases in private care than in asylums. Chloral, in the writer's experience, is the

most trustworthy and least harmful of narcotics, and may sometimes be usefully combined with morphia. The latter is useful in some cases of active melancholia, and in mild senile excitement and restlessness, but should be avoided when the excitement is very acute, and where there is any exhaustion, and in cases which refuse food, or in which dyspeptic troubles are present. Hyoscyamine and the hydrobromate of hyoscyne should not be used at all when the patient is young, and should be avoided whenever possible. The former finds its chief use in the restlessness, violence, and destructive habits of the confirmed general paralytic, but should not be given unless the appetite be good. Bromide of potassium, digitalis, henbane, Indian hemp, ergot of rye and Calabar bean have all had their fervent advocates, but with the exception of the first-named are little used. Bromide of potassium has a distinctly bad effect upon some epileptics, apparently it lessens the number of fits, but favours the substitution of acute maniacal outbursts. Paraldehyde is very useful in some cases, but is nauseous and is generally refused by patients, and the same objection applies to hypnone, which is, however, yet upon its trial as a hypodermic remedy. Bromidia is useful as a mild soporific. Urethane appears to be useful, but in somewhat larger doses than at first recommended, and the latest addition to the long list of narcotics, sulphonal, is being tried with favourable results.

Generally speaking, the practitioner will do well to be chary in prescribing narcotics. Chloral is the most generally useful, and acts well hypodermically or by the rectum.

For excitement, when the bodily condition is good, prolonged hot baths and the wet and dry packs are used, but are not free from objection nor from danger. In cases with much excitement combined with bodily prostration, such as in active melancholia, or in puerperal insanity, energetic feeding, if necessary with the aid of the stomach-tube, and the free use of brandy, are absolutely essential. In such cases a few hours' delay may mean an aggravation of the symptoms, or even the death of the patient.

When the acute symptoms subside, general attention to the bodily health, the use of tonics, especially iron and cod-liver oil, is to be commended. If there be a tendency to secondary stupor or dementia, the cold shower-bath and the Russian douche-bath will be found stimulating. The value of electricity and

massage is still an open question. In cases with stupor, hypnotism has lately been given a few trials.

G. T. REVINGTON.

INSANITY, CLASSIFICATION OF.

—This subject is full of difficulties, and while many attempts have been made, we are yet without a satisfactory classification. Various bases have been used for the purposes of classification, and the following may be mentioned, and the names will in each case indicate sufficiently for the present purpose the basis which was used—the somatic, the ætiological, the somato-ætiological, the symptomato-ætiological, the physiological, and the psycho-symptomatological. But in the midst of all this variety, authorities are agreed that there are three main forms of insanity, to which broadly speaking all cases can be reduced, namely, melancholia or depression of brain function, mania or exaltation of brain function, and dementia or weak-mindedness, which includes amentia or congenital weak-mindedness, and the acquired weak-mindedness of adults.

Even general paralysis and epilepsy can be included, for while maniacal and melancholic symptoms are common in these diseases, the most striking characteristic of both is the inevitable progress towards dementia.

In the writer's opinion another form should be added, delusional insanity, in which, although there is frequently no marked depression nor exaltation of brain function and the dementia which is always present may remain for years only a slight factor, there is definite distortion of brain function, as shown in the fixed and often outrageous delusions which exist, in spite of fair reasoning power and judgment, upon topics other than the subject of the delusions.

But having recognized these primary forms, what shall be the basis for subdivision, what system of nomenclature will express and convey most information? In the writer's opinion a classification according to the period of life will incontestably be found the most practically useful. To describe a case as adolescent stupor or puerperal mania will ever be a description satisfying as to symptoms, and useful as to treatment. The character of the symptoms and the mode of treatment turn far more upon the stage to which the development of brain and body has attained than upon any other factor in the case.

The following is an arrangement which seems to answer all the requirements of a scientific classification:—

- | | | |
|---|---|---|
| The four primary forms of mental unsoundness. | { | 1. Melancholia (depression of brain function). |
| | | 2. Mania (exaltation of brain function). |
| | | 3. Delusional insanity (distortion of brain function). |
| | | 4. Dementia (weak-mindedness—"the goal of all the insanities"—including amentia or congenital weak-mindedness). |

Scheme of Classification according to the Period of Life at which the Disease appears.

- | | | |
|---------------------------------------|---|---|
| Insanities of infancy. | { | Imbecility, idiocy. |
| Insanities of childhood. | | Mania, melancholia, moral insanity, epileptic insanity. |
| Insanities of adolescence. | { | Mania, melancholia, insanity of stupor, epileptic and hysterical insanity, sexual hypochondriasis. |
| Insanities of maturity. | | Mania, melancholia, puerperal and lactational insanities, delusional insanity, alcoholic insanity, general paralysis. |
| Insanities of the climacteric period. | { | Mania, melancholia, delusional insanity, visceral hypochondriasis. |
| Insanities of decay. | | Mania, melancholia. { With dementia as a prominent characteristic, and probable conclusion. |

G. T. REVINGTON.

INTESTINAL OBSTRUCTION.

—This term is generally limited to cases in which there is complete obstruction to the passage of the contents of the bowels, solid, fluid and gaseous, the state of merely imperfect evacuation of these contents being regarded as "constipation."

This distinction is however, by no means absolute, since the causes which may eventually operate to produce complete obstruction frequently, in their earlier manifestations, exhibit merely the symptoms of irregular constipation. Again, owing to the variety of the conditions which lead to obstruction, in addition to the cardinal symptom of complete constipation, there are often concomitant symptoms varying in severity and in their relative predominance.

In some cases, where the health has been previously good, and the intestinal functions regularly performed, the symptoms of obstructions set in almost suddenly, with or without some exciting cause, such as a strain or injury, and rapidly become urgent. Such cases are

generally denoted by the term *acute*. In other cases the absolute arrest of the normal evacuation is more gradual, and is preceded by a period of imperfect or irregular performance of this function continued over a longer or shorter time. Such are the *chronic* cases.

The use of these terms is however only to be regarded as a matter of clinical convenience. They by no means imply that the underlying anatomical condition is in the one case recent or acute, in the other of long standing or chronic. For although in many cases it may be true that the condition giving rise to sudden and urgent symptoms is itself suddenly developed (*e.g.*, impaction of a gall-stone, or an intussusception), yet there is frequently no sort of parallelism between the clinical course and the anatomical state. For a condition of long standing may either directly or indirectly be first revealed by the onset of acute symptoms, and yet in other cases the same condition will have a clinical history more in accordance with what is known of its nature and probable duration.

With this caution, which will receive abundant illustration hereafter, it will be most convenient to introduce this subject by considering generally the symptomatology of the acute and chronic types.

ACUTE OBSTRUCTION occurs, as its name implies, with suddenness.

Symptoms.—The patient may have been previously in good health, may have never had any symptoms of derangement of the bowels, when he is seized with a severe attack of griping pain in the belly. On inquiry it may not be possible to attribute this attack to any antecedent circumstance, such as indiscretion in diet, injury or strain, although in a certain number of cases such assumed exciting causes do exist. The pain may be very severe indeed, and it is usually referred to the region of the umbilicus, no matter where the seat of the obstruction may be. It is mostly followed speedily, or after a few hours' interval, by vomiting. From the onset there is no action of the bowels, not even the passage of flatus, and this notwithstanding that the occlusion may be high up in the intestine.

From this it would appear that owing to the sudden mechanical interference with its normal action the bowel below the seat of obstruction becomes quite paralysed, although it may be possible to produce an evacuation of the contents of the colon by means of enemata.

Urgent symptoms of obstruction may be induced (by reflex paralysis?) by sudden mechanical irritation of the intestinal nerves, without there being any actual obstruction—*e.g.*, acute strangulation of omentum, or of one wall of the gut.

The vomited matters at first consist of the gastric contents, but soon become bilious or duodenal, and have a greenish or bright yellow colour. The act of vomiting is excited whenever food is taken, but after a time it tends to recur independently of taking food. Within a variable period, seldom more than three or four days, the vomited matters become obviously stercoraceous. It is generally considered that the *early* occurrence of vomiting indicates that the seat of obstruction is situated high up in the small intestine, but this is not a safe diagnostic rule, since the same fact may be observed whenever the obstructing cause is such as to severely strangle the bowel. Associated with this symptom, and in a measure dependent upon it, there may be great thirst, and also a marked diminution in the amount of urine passed, perhaps even suppression.

The belly is more or less distended, the degree of this distension depending both on the situation of the obstruction and on the duration of the symptoms. It is comparatively rare in acute cases for the individual coils of distended intestine to be visible through the parietes, although there are many exceptions to this, and the presence of visible peristalsis cannot be held to exclude an acute case. The distension, as a rule, is fairly uniform, but may exhibit a certain want of bilateral symmetry.

On palpation, there is tenderness, which usually develops a short time after the pain, but it is seldom so definitely localized as to be a trustworthy guide to the site of the obstruction. In some forms a tumour may be plainly felt, through the abdominal parietes (*e.g.*, intussusception) or on rectal examination, or else the latter only reveals the swelling formed by the coils filling the pelvis. To percussion the abdomen is in all parts tympanitic.

The patient rapidly becomes exhausted by the pain and incessant vomiting, the features become pinched, the pulse small, perhaps thready, the respirations shallow and rapid, and the temperature subnormal. There is no impairment of intelligence, but the condition is that of collapse, and death follows.

CHRONIC OBSTRUCTION has a different clinical history. In it the patient has

probably suffered for months or years from irregular action of the bowels, he has been either habitually constipated, requiring frequent recourse to purgatives, or has been subject to attacks of constipation alternating with diarrhoea, the latter probably being really excited by the former. At any rate there is in his previous history sufficient to point to the final complete obstruction being only the necessary sequence of deranged action of the intestine of long standing. Sometimes, but not invariably, he may have noticed that the tendency to constipation has gone on increasing with the lapse of time, and, perhaps, that the motions have become more scanty in amount or smaller in size. Then comes a time when the bowels no longer respond to the measures on which reliance has hitherto been placed for their relief, and perhaps stronger purgatives are tried with a like negative result, except the production of more or less severe griping pain. It may be learnt too that there has been of late a greater liability to attacks of "colic" than hitherto. Enemata also fail to procure the desired relief. After some days of absolute constipation, when even flatus does not pass, the abdomen becomes more and more distended and the true nature of the case is revealed. Now at length vomiting may set in, and, in time, become stercoraceous. The patient sinks into a state of collapse, in which he may die.

Differential Diagnosis of Acute from Chronic Obstruction.—Amongst the symptoms and signs which characterize the chronic cases as distinguished from the acute are, the comparatively greater amount of urine excreted, the visibility of the distended coils, which may be often seen in peristaltic movement (due to the hypertrophy of the muscular coat of the bowel above the obstruction?) and perhaps the presence of tenderness and fulness over the cæcum. There are other signs which may occur more frequently in this form, and which depend on the site of the obstructing cause, to which reference will be made in speaking of the diagnosis of the seat of obstruction.

There is one sign yielded by examination of the urine, which, though not pathognomonic, is yet very constant in intestinal obstruction, being, in the experience of the writer, far better marked in acute than in chronic cases. This is the presence of indican (or its derivatives) in the urine, which may be ascertained by gently adding to it some

hydrochloric acid in the cold. At the line of junction of the two fluids there will appear a violet or dark bluish-black band, the tint being deeper in proportion to the amount of the "indican" present. In a case recently under the care of the writer, this test, which was well marked during the symptoms of obstruction, disappeared after the obstruction (a band) had been relieved by operation. The presence of indicanuria in such cases may perhaps be due to the absorption of indol retained in the bowel with other faecal products or possibly in part to the nervous disturbance in the abdomen caused by the attack.

The Diagnosis of the Seat of the Obstruction is by no means easy. There are, it is true, certain rules (not wholly without exception) which may be usefully applied to distinguish between obstruction situated in the large and the small intestine, but beyond this rather wide limit it is often impossible to go.

The seat of pain or tenderness, which, as stated, is generally localized about the region of the umbilicus (probably because of the contiguity to the solar plexus, where the painful impression may be referred), is not to be relied on. The very early onset of vomiting may be taken to indicate not only that the case is acute but that the obstruction is high up in the intestine.

The obstruction may be inferred to be in the *small* intestine, when, (1) the abdominal distension is most marked anteriorly, the flanks being comparatively flattened; (2) large quantities of water can be readily injected into the bowel through a long tube introduced into the rectum, and when it can be proved by auscultation that the fluid passes into the cæcum; (3) indican is present in the urine in considerable quantity. The fact that in cases of obstruction of the small intestine there is great diminution in the amount of urine passed is probably allied to the severe and prolonged vomiting which so often characterizes this form, and cannot therefore be considered as a fact of much diagnostic value.

On the other hand the obstruction is probably seated in the *large* intestine if there be (1) marked general distension, and especially fulness of the flanks, of both flanks if the obstruction be in the rectum or sigmoid, of the right more than the left if it be in the splenic or hepatic flexure; (2) failure to inject much water or to detect evidence of its passage into the cæcum; (3) an obstruction detected in or outside the rectum

on digital examination. This is of course obvious. In the case of obstruction higher up some aid might possibly be gained by the attempt to pass a long bougie into the colon, a proceeding which may, however, lead to a fallacy from the difficulty often experienced in passing the instrument through the sigmoid flexure. At one time much value was attached to the introduction of the whole hand and arm into the bowel, but this procedure requires some skill as well as the possession of a small hand by the operator. It is not practised now to any extent.

The **Diagnosis of Intestinal Obstruction in General** has in the acute cases to be made mainly from *acute peritonitis*, especially when the latter is dependent on perforation. In some cases, indeed, the distinction between these two conditions is well-nigh impossible, for in the history of the attack, the mode of onset, the occurrence of pain and vomiting, there may be no distinctive feature of the one over the other. Since, however, the causes of such perforative peritonitis (exclusive of typhoid ulceration) are practically limited to perforation of the appendix or of a gastric or duodenal ulcer it may be possible by careful exclusion of these conditions to make a diagnosis. It is, however, here that the value of laparotomy as an exploratory operation is seen, a procedure which will be also available for the treatment of the case.

In acute peritonitis there is usually more general pain and exquisite tenderness of the abdomen than occurs in simple acute obstruction; the patient lies on the back with the knees raised; the signs of collapse are marked, especially the quick small pulse, and usually there is some rise in temperature. Moreover, since peritonitis is rarely idiopathic, every care should be taken to discover whether there be any assignable cause for its occurrence.

In *chronic* cases the diagnosis rests between permanent obstruction or constipation, and here the effects of repeated and large enemata are of great service. It is seldom that constipation *per se* leads to complete obstruction, but this sometimes does happen, and in that case there is no need of the distinction here drawn, at least for general diagnosis.

VARIETIES OF INTESTINAL OBSTRUCTION.—There are several ways of classifying the various causes of obstruction. Mention has been already made of the division into acute, and chronic, examples of which are to be found in both the

small and large bowel, but perhaps in the former the acute cases preponderate, in the latter the chronic. Or the conditions may be considered in reference to the part of the intestine in which they commonly occur. Or the division may have reference to the relation of the obstructing cause to the tube which is thereby occluded, as causes operating within the intestine, in its walls and outside the canal. The order in which they are discussed here is framed rather on their anatomical and pathological affinities.

1. Occlusion by faecal accumulations, concretions, gall-stones, foreign bodies.

2. Obstruction from strangulation of the intestine, as in hernia and by bands.

3. Obstruction from malposition of the intestines as in volvulus and intussusception.

4. Obstruction by compression and traction.

5. Strictures, congenital, cicatricial or cancerous.

6. Tumours within the intestine.

Class I.—FÆCAL ACCUMULATION, GALL-STONES, &c.—Fæcal Accumulation.—This, which may be the outcome of habitual constipation, depends for its supervention upon atony of the colon, where the chief accumulation takes place. The more or less paralysed bowel may become greatly dilated and enormously distended with fæces, which are hardened and fixed. Sometimes the mass can be readily felt through the parietes, and under a prolonged and patient course of enemata, aided, if need be, by mechanical dislodgment of the contents of the rectum, the mass may be observed to gradually lessen.

The prognosis in such cases is rarely grave, but there is always a liability to recurrence, if the evacuation of the bowels be neglected. Indeed, in some cases this form of obstruction has proved fatal, and has been mistaken for a stricture of the colon, which it simulates in its course. The operation of colotomy has been done on this mistaken diagnosis.

Impacted Gall-stone.—The seat of impaction of a gall-stone in the intestine is likely to be the ileum, since the larger calibre of the duodenum and jejunum admits of the passage of a stone which could not pass through the ileum. The occurrence is mostly due to the escape of a gall-stone of large size into the bowel by ulceration from the gall-bladder, rather than from the duct, into which it is rare for stones large enough

to occlude intestine to pass. The onset of symptoms of obstruction is sudden, the pain severe, and vomiting urgent. There may have been a history of former attacks of biliary colic and jaundice, but it is possible that no such events have occurred, in which case a material aid to a correct diagnosis will be wanting. The patient may have suffered for some time previously from a pain in the hypochondrium, and it is possible that the existence of a tumour in the site of the gall-bladder may have given rise to the suspicion of the presence of a gall-stone before the onset of intestinal symptoms, which mark its escape into, and lodgment in, the bowel. Unless, however, there have been previous colic and jaundice, such a diagnosis would not be justified.

Enteroliths formed of matted hairs that have been swallowed, or of semi-calcified masses, as from insoluble salts of lime, magnesia, or bismuth, and all manner of *foreign bodies* swallowed accidentally or intentionally may come to block the bowel. Cruveilhier gives a drawing of a cecum filled with cherry-stones, and a similar case was under the care of Sir W. Jenner in University College Hospital some years ago. In that case the collection of stones could be felt during life. Obstruction has also been caused by a collection of lumbricoid worms.

Class 2.—INTERNAL STRANGULATION.

—One-fourth of the total number of cases of intestinal obstruction from all causes, (excluding hernia and affections of the rectum) are due to internal strangulation according to Treves.* This statement can be substantiated by the comparatively small experience of any individual hospital physician. The mode in which the strangulation is effected is very varied, and only some of the more common varieties will here be mentioned.

(1) **Strangulation through apertures**, as hernia through the foramen of Winslow, obturator hernia, retro-peritoneal hernia, or the passage of a loop of intestine through a rent in the omentum or mesentery, and the constriction of the gut, partly by the latter, partly from the weight of the bowel causing it to be sharply bent over the margin of the aperture.

* "Intestinal Obstruction," London, 1884. For fulness of detail and scientific study of the subject there is no work equal to this admirable monograph.

(2) **Strangulation by Bands.**—

These are the most common, and the "bands" may be formed in a variety of ways. Some are formed by old peritonitic adhesions, and in such cases there may be a previous history of localized peritonitis. Or a loop may be caused by the adhesion of the vermiform appendix to the parietes, to a neighbouring part of intestine or Fallopian tube or other viscus. Or the band may be formed by the adhesion of one of the appendices epiploicæ to another, or to the appendix, or elsewhere; the epiploic appendage becoming more or less elongated and cord-like. Or the omentum, from previous peritonitis, may have become adherent, forming a loop through which coils of intestine may pass (a condition liable to ensue after hernia).* Or finally, and this forms a comparatively large class, the constricting band may be formed by a Meckel's diverticulum, which has either retained its attachment at the umbilicus, or, what is more frequent, has become adherent to bowel or parietal peritoneum. The obliterated vessels passing from the region of the bladder to the umbilicus may similarly form constricting cords.

In these and other ways a cord-like loop is formed, through which a portion of intestine, generally as a single loop, may pass and become constricted. Hence in nearly all these cases it is the small intestine that is strangulated, and the onset of symptoms is acute. Where it is possible to obtain a clear history of a previous attack of peritonitis (or of a herniotomy) the diagnosis may be aided, but such evidence is frequently wanting. As a rule the constriction is solitary, but now and then the bowel will be found to be strangulated at more than one spot. The effect of the constriction is to cause great distension of the gut above it, and the collapse of all the coils below. As pointed out by Dr. Kingston Fowler, these collapsed coils tend to fall into the pelvis, where they may be felt on rectal or vaginal examination, and discovered on abdominal section.

Treves points out that strangulation

* Several cases are recorded of intestinal obstruction following ovariectomy, some of which fall under this category, being due to the formation of peritonitic adhesions and loops. This operation is also sometimes followed by a condition of paralytic distension of the bowels, which is relieved by saline purgatives, or by the passage of the long tube.

by bands is more common in males than females, but that in the case of peritonitic adhesions the numbers are about equal, the greater frequency of pelvic peritonitis in the female sex being balanced by the predominance of typhlitis in the male. The latter fact also explains why strangulation due to an adherent vermiform appendix occurs more often in the male.

The same authority states that this form of intestinal obstruction mainly occurs between the ages of twenty and forty. These cases have been termed "internal hernia," and of course in dealing with them care must be taken to examine all the sites of hernia, before arriving at the conclusion that the obstructing cause is within the abdomen.

Class 3.—MALPOSITION OF INTESTINES.—Under this head may be included the conditions of (1) Volvulus and (2) Intussusception.

(1) **Volvulus.**—By this is meant the twisting of the bowel upon itself to such an extent as to completely occlude its canal. The twisting may involve the small or large intestine, the latter being perhaps the more frequent. In order for it to take place, it is requisite that the bowel should be furnished with a long mesentery, as is sometimes the case with the descending colon or the sigmoid. The occurrence of volvulus may sometimes be referred to an injury or unusual effort on the part of the patient. When it happens, the symptoms are mostly acute, and referable to obstruction of the large bowel. The effect of a volvulus upon the intestine itself is similar to that produced by strangulation, but of course if the colon be the seat of the accident there will be much greater distension than in the case of involvement of the ileum.

(2) **Intussusception** or invagination is a frequent cause of obstruction, especially in the young. In this condition a segment of bowel becomes invaginated into the portion next below it, thus forming a cylindrical tumour of variable length. The determining cause of the condition is no doubt undue peristalsis, which may have been excited by some irritation of the bowel.* Thus it

happens in the course of catarrhal enteritis, or it is associated with a tumour projecting into the interior of the bowel from its wall. But it is not always possible to refer the attack to any marked antecedent, such as the occurrence of attacks of colic, which would indicate that the bowel contained some material which it was endeavouring to get rid of by violent peristaltic movement. Thus the presence of a lumbricoid worm may favour the occurrence of intussusception, or of indigestible articles of food or other foreign body.

The site of intussusception varies, and certain varieties may be enumerated depending on this fact, viz. :—

(a) *Ileo-cæcal*, where the invagination begins with the descent of the ileo-cæcal valve into the cæcum and colon, so that the intussusceptum is formed by the ileum as well as by the cæcum and ascending colon, according to the extent of the invagination. This is the most common variety, and is occasionally of such extent that the ileo-cæcal valve may be felt per rectum.

(b) *Colic*.—In this variety the invagination is limited to the large intestine, as of the ascending into the transverse portion, or of the latter into the descending colon.

(c) *Neal*.—Here the ileum is alone concerned. It forms a typical instance of the condition.

(d) *Ileo-colic*.—This variety is characterized by the prolapse of the ileum through the lips of the ileo-cæcal valve. It is rare, and must be clearly distinguished from the ileo-cæcal variety.

The mere fact of the occurrence of intussusception does not suffice to cause obstruction. It is possible for the passage through the invaginated portion to be still pervious, and the condition may in such circumstance become chronic, and not be marked by the urgent symptoms usually present. For in the majority of cases the invagination is productive of constriction of the invaginated portion at the point where this becomes continuous with the ensheathing portion. In consequence of this there is an impediment to the return of blood from the included bowel and its mesentery, so that these become swollen, and thus increase the liability to complete constriction. The intussusceptum becomes intensely congested, and its vessels on the mucous membrane may rupture, filling the interior with blood clot. Then, owing to the strangulation, a process of necrotic softening takes place, inflamma-

* The condition is sometimes met with, especially in the young, on post-mortem examination, without any symptoms of its occurrence during life. The appearances in such cases denote that the invagination (which is often multiple) occurred just before death.

tion is set up between the contiguous serous coats of the two portions of bowel, which thus become adherent. After a time the detachment of the intussusceptum is effected by sloughing (provided that the patient survive so long), and it may come away entirely, and thus naturally restore the continuity of the bowel. The circular ulceration which remains may subsequently cicatrize.

Such spontaneous recovery is, however, rare, the case often terminating fatally from exhaustion due to the obstruction, and to the effects of blood-poisoning from the gangrenous intestine. It must not be supposed, however, that intussusception, unrelieved by art, will invariably run this serious course. There can be little doubt that occasionally the condition may occur and be spontaneously reduced after an interval of a certain time, or very shortly after the occurrence of the intussusception, without any serious symptoms having been set up, whilst, as remarked, the condition may sometimes be more or less chronic, and may have existed a long time before any obstruction is produced.

Symptoms.—The occurrence of intussusception is marked by much pain in the belly, by tenesmus, and perhaps some diarrhoea, and by vomiting and anxiety. There may in a few hours be some melæna (an important indication), which lasts only a short time, that is, so long as there is extreme congestion of the invaginated segment, a condition which precedes complete stasis. The detection of a tumour on palpation of the abdomen, for which it is often necessary to administer an anæsthetic, is however the chief diagnostic sign. This is of a smooth cylindrical or sausage shape, and usually lies in the position of the ascending colon, or even in that of the transverse colon. It may even be wholly on the left side of the abdomen, and its lower extremity be felt per rectum. In some cases the tumour may be observed to shift its position as the intussusception continues to increase.

The *diagnosis* has to be made from other forms of acute obstruction; and the history of melæna and the presence of the characteristic tumour render this comparatively easy. It has further to be distinguished from a fæcal tumour, but it is only in the chronic and milder cases that this mistake is likely to occur. Between phyllitis and intussusception the diagnosis may be more difficult, but here the suddenness with which the swelling

appears, as well as the melæna, mostly suffice to point to the latter.

Class 4.—COMPRESSION, TRACTION AND KINKING.—Obstruction may be brought about by the more or less general matting of the intestines by peritonitis, as in general or local chronic peritonitis, tubercular or otherwise. The adherent coils unable to exert their natural peristalsis tend to become filled with faeces. In such cases there is a more or less prolonged history of abdominal symptoms before the onset of signs of obstruction. The cases therefore fall mainly under the "chronic" class, where complete obstruction is preceded by obstinate constipation, and often by attacks of colic. The adhesions may be limited to a few loops only, as when they result from localised peritonitis in the vicinity of the cæcum or the pelvic organs.

In obstruction from tumours external to the bowel, the rectum is chiefly involved. The condition is far more often met with in females than males. The commonest cause is the pressure due to an enlarged uterus or a fibroid tumour arising from the uterus or even retroflexion of this organ, the unyielding walls of the pelvic cavity compelling the flattening of the bowel. The diagnosis is readily made on rectal and vaginal examination.

The condition of "traction" pointed out by Mr. Treves is rare. It has been chiefly observed in connection with an adherent diverticulum which drags on the ileum and eventually produces its occlusion. This also is marked by chronic symptoms.

An analogous state is that described as "kinking," where, owing to adhesion of the small intestine at one spot, the bowel (generally the ileum) becomes acutely bent on itself. The writer has seen this produced by a contraction of the mesentery, the result of old inflammation of the mesenteric glands, which had become cretified at this spot. The patient had had previous attacks of the same kind, in which obstruction had lasted for some days and had then been spontaneously relieved. On the occurrence of a second attack the symptoms were more severe, and laparotomy was performed. It was found necessary to resect the portion of gut at the site of the kink. The case proved fatal.

Class 5.—STRICTURES.—The intestine may be completely occluded at birth by the non-union of the hind gut and anus. This condition of so-called "imperforate anus" or "atresia ani," finds a counter-

part in the duodenum, where occasionally a similar entire dissection of the continuity of the canal is exhibited as a congenital malformation. But short of complete occlusion strictures of the small intestine which are manifestly of congenital origin, are occasionally met with.

Symptoms.—The subjects of this form of malformation may pass through the early years of life without any apparent discomfort, but as age advances and the narrow passage of the strictured portion becomes more disproportioned to the calibre of the rest of the tube, there may gradually arise symptoms of intestinal difficulty culminating in complete obstruction. It will be generally observed in such cases that the abdomen becomes more distended in its central portions, and that the coils of intestine above the stricture become evident through the parietes, showing frequently their peristaltic movement. Such a chronic history and course of symptoms in a comparatively young subject may direct suspicion to this malformation, but the diagnosis is purely conjectural.

Of acquired strictures by far the most common are those which are due to **Malignant Growths of the Intestine** (mostly epitheliomatous). These strictures occur in later life, more commonly in males than in females, and are produced by the contraction of a growth which, arising in one part of the bowel, may come to entirely surround it, and by its destruction form the typical "annular ulcer." In the vast majority of cases these strictures are to be found in the large intestine, and (excluding the rectum) at the flexures of the colon far more often than in other parts. In frequency they occur more in the sigmoid than in the splenic flexure, and more in the splenic than in the hepatic flexure.

Symptoms.—The history of such cases is essentially a chronic one. It is difficult to determine when the stricture commenced to cause any definite symptoms, so insidious is their onset. Sometimes indeed there is no suspicion of any grave trouble until the signs of obstruction set in almost acutely. As a rule the patient may have been subject to habitual constipation for some time, alternating perhaps with "diarrhoea" attributable to the presence of accumulated faeces. He may also have experienced an increasing liability to attacks of colic, especially after taking purgative medicines. Then the abdomen will become more distended and voluminous, there

may be aching pain and tenderness over the caecum, which is especially liable to become distended and even ulcerated, whilst owing to the long duration of the obstruction, the coils of intestine may become plainly visible. During an attack of colic peristalsis may be visible. Vomiting is a late event; it may not even occur at all. On the other hand, these cases may be characterized by recurrent attacks of copious faecal vomiting, with intervals of comparative comfort.

Diagnosis.—With such a history, the determination that the seat of the obstruction is in the colon, together with the age of the patient, justify the conclusion that the case is one of this nature. The condition most likely to be mistaken for it is that of chronic constipation with atony and dilatation of the colon.

It may perhaps be here pointed out that in no case should rectal examination be neglected, since of all seats of stricture, especially malignant and syphilitic, this part of the tract is the most frequently involved. Nor must a history of diarrhoea be allowed to set aside this necessity, for the very presence of such disease may create an irritable condition of the mucous membrane, and a constant desire to defaecate. Tenesmus and occasional melæna are further common signs of rectal disease.

Of other forms of stricture due to previous ulceration it must suffice to give a mere enumeration, so rarely do they occur. Such, for instance, are strictures following tubercular or syphilitic ulceration of the bowel or following the spontaneous detachment of an intussuscepted portion of intestine. Dysenteric and even typhoidal ulcers have very rarely been known to lead to stricture.

6. TUMOURS WITHIN THE INTESTINE.

—Obstruction may be also caused by the gradual filling up of the lumen of the intestine by new growths arising in its wall. Here again cancerous tumours are the most common, and they are perhaps more frequent at the ileo-caecal valve than elsewhere. Some growths indeed tend rather to dilate the bowel than to contract it as pointed out by the late Dr. Moxon. Amongst the rarer kinds of tumour are fibromata and lipomata, which may come to cause mechanical obstruction; various forms of polypoid growth, fibro-myxomatous or other, may possibly be so abundant or so large as to produce a like result. Similar in effect and in clinical characters are cases of chronic intussusception.

The *diagnosis* has to be made chiefly

from faecal tumours when the intestinal condition is apparent to palpation. The obstruction is generally of long standing.

The differential diagnosis of the foregoing conditions must be based upon the consideration of several points in addition to those which are more or less characteristic of the particular form of obstruction, the acuteness or otherwise of the symptoms and the determination of the site of the occlusion. It must be borne in mind that several of the conditions named take their origin in the presence of the relics of pre-existing peritoneal inflammation, mesenteric disease or hernia, and a full inquiry into the previous history of the patient may thus sometimes be of much service. Thus, a history of abdominal symptoms in early life, or of pelvic or caecal inflammation may shed light upon the long subsequent occurrence of symptoms of intestinal obstruction and especially of cases of strangulation. Then again the sex and age of the patient may point in favour of one rather than another form of obstruction. It may be stated almost aphoristically that intussusception is an affection of childhood, strangulation of early adult life, stricture of the colon of advanced life, although there are, of course, exceptions in the case of each of these. If congenital malformation be suspected then search may be made for any other congenital defects, since such errors of development often occur together. These and like considerations may aid in arriving at a conclusion, but it is often impossible to determine, especially in acute cases, the precise nature of the lesion without actual inspection, after exploratory laparotomy.

The Treatment of Intestinal Obstruction must necessarily vary with its cause, but there are certain general principles and methods that are applicable in the majority of cases.

In the first place the administration of purgatives must be absolutely deprecated; much pain, and no good, if not positive harm, may follow their employment. It is, however, incumbent, both as a matter of diagnosis and treatment, to have recourse to copious enemata. For if the condition be merely one of faecal accumulation, perseverance in this course may be rewarded by the removal of the obstruction. It is, however, unwise to continue these attempts too long, and often the severity of the symptoms and exhaustion of the patient will point to their inutilty.

The administration of opium is valuable in allaying pain and controlling peristalsis

and vomiting, but for these very reasons it is unadvisable to prolong its use, lest the urgency of the symptoms be masked, and the time at which there is reasonable hope of relief by operation be overpassed. At the same time the treatment by opiates, combined with low diet, has been advocated as all-sufficient for the cure of many severe cases which in other hands would most certainly have been submitted to operation. It ought to be clearly understood that if the opium treatment be relied on it must not be abandoned in favour of operation at a late stage and when the patient is in a state of extreme exhaustion. In this way the latter procedure has indeed but slight chance of saving the patient, and it seems unscientific as well as wrong to suffer such exhaustion to occur, if the case be seen early enough to anticipate its appearance by speedy resort to operation. This at least is the view of the writer, and although unfortunately but few cases of acute internal strangulation recover, even after laparotomy and the division of the constricting band, it is not possible, in face of the known pathological conditions to refrain from advising an early recourse to this interference as affording the best chance of recovery in an otherwise almost necessarily fatal disease.

But there are less severe measures than abdominal section, which in certain cases may be tried before resorting to it, provided that the patient's strength admit of the delay that they occasion. One of these is free lavage of the stomach. Cases have been recorded, especially in Germany and France, where this simple procedure, frequently repeated, has been followed by the disappearance of the symptoms of obstruction. The writer has adopted the plan in one or two cases, but only as a preliminary to laparotomy, where the faecal vomiting was frequent and distressing, and believes that it is of great advantage in cleansing the stomach of its foul contents, thereby removing one cause of the depression of the vital powers, but that the measure *per se* could effect the liberation of a strangulated bowel is difficult to conceive. There is also a procedure advocated by Mr. Hutchinson, which he terms "taxis," that may be tried for internal hernia as for external, and abandoned in favour of surgical interference if it fail in its object. The method is best described in Mr. Hutchinson's own words:—"The first point in abdominal taxis is the full use of an anæsthetic, so as to obliterate all muscular resistance. Next (the

bowels and bladder being supposed to be empty) the surgeon will forcibly and repeatedly knead the abdomen, pressing its contents vigorously upwards, downwards, and from side to side. The patient is now to be turned on his abdomen, and in this position to be held up by four strong men, and shaken backwards and forwards. This done the trunk is to be held feet uppermost and shaking again practised directly upwards and downwards. Whilst in this inverted position copious enemata are to be given. The whole proceedings are to be carried out in a bonâ fide and energetic manner. It is not to be the name of taxis, but the reality; and great perseverance is to be exercised. The inversion of the body, and succussion in this position, is on no account to be omitted, for it is possibly the most important of all" (*Archives of Surgery*, July 1889, No. I, p. 6). It may be conceded that such a procedure can untwist a volvulus, or indeed enable a loop of intestine to escape from a lax band, and Mr. Hutchinson has been fortunate in the successful issue of some apparently severe cases. Yet the very energetic character of the procedure must, if it fail, materially exhaust the patient, and render him unfit for the severer measure of laparotomy. Thus, in the treatment of internal strangulation we seem to be on the horns of a dilemma, and one can hardly avoid the conclusion that as soon as the diagnosis is made (the sooner the better) the division of the constricting band should be attempted. As regards the operation itself, it may be mentioned that the point before alluded to as first shown by Dr. Fowler,* that the collapsed coils tend to drop into the pelvis, is of much practical value, as enabling the surgeon to find his way to the seat of constriction more rapidly than if he attempted to do so by tracing the distended bowel first in one direction and then in another. Any plan whereby the duration of the operation can be lessened must be welcomed. The possibility of there being more than one constricting band (although rare) should always be borne in mind.

So far we have spoken chiefly of cases of acute obstruction by strangulation. There are, however, in other forms of obstruction, such, for example, as intussusception and stricture, other lines

of procedure. In the former, when the diagnosis has been verified by the discovery of the characteristic tumour (under chloroform if necessary), attempts to effect reduction should be made by the injection of air or water into the rectum. The earlier period at which recourse is had to these measures after the onset of symptoms the more likely are they to succeed. If they fail, then there are two courses open, either to invoke surgical aid to reduce the invagination after laparotomy (and in some cases this has proved very successful, in others it has been found impossible to effect the reduction) or to administer opium freely and trust to the natural process of separation of the invaginated bowel, supporting the patient by nutrient enemata, suppositories, and stimulants, as well as may be, during the prolonged period that must ensue before the spontaneous detachment is effected. Needless to say that in many instances the strength of the patient has given way before what may be termed the "natural" cure could be completed. In the case of an annular stricture of the colon the usual procedure recommended is the performance of colotomy. If the diagnosis be that the stricture is seated in the sigmoid flexure, then the operation may be performed on the left side, but in all other cases it should be a right colotomy, not only because of the uncertainty as to the exact site of the stricture and the avoidance of the risk of cutting down upon collapsed bowel, but also because in cases of long-standing accumulation the cæcum often suffers from the distension, and its relief is more certainly obtained by that operation. Surgery has advanced beyond this merely palliative measure, and cases of successful colectomy have been recorded, the limitation of the disease in the bowel favouring such an expedient.

For the relief of extreme flatulent distension, especially in cases of obstruction of the large intestine, it is sometimes advisable, and even necessary, to puncture the distended gut. This should be done with a very fine trocar (the needle of a hypodermic syringe would suffice), and the gas allowed to escape. The procedure only affords a temporary relief, and is likely to be followed by colicky pain, due to the peristalsis of the bowel being excited by the relief of the distension. It is well, therefore, to give opium when the puncture is made. It may happen that the removal of the tympanites will also be followed by the

* N.B.—Mr. Hulke had independently noted the importance of searching for collapsed bowel.—Ed.

passage of feces through the obstruction, owing to the stricture being relieved from undue pressure above. The procedure is not in all cases free from risk, since the dilated intestine may not be enabled to contract, and so close the opening, in which case there will be fecal extravasation and peritonitis.

In all cases the amount of food administered to the patient should be very small and concentrated, consisting of milk, meat essence in small quantities, or, if vomiting be persistent, rectal feeding must be resorted to. In the less severe cases, where after a few days the obstruction is spontaneously relieved, the diet must continue to be carefully controlled. In such cases also, belladonna will be found of greater service than opium. SIDNEY COUPLAND.

INTESTINES, TUBERCULAR DISEASE OF.—The intestines are seldom, in the adult, the primary seat of tuberculosis, but they are affected secondarily to pulmonary phthisis with extreme frequency (76 per cent. of cases examined post mortem at Brompton Hospital). This has been attributed to secondary infection by the sputum, a view which is supported (1) by the onset of symptoms being generally subsequent to the formation of freely discharging vomicae, and (2) by its great frequency in laryngeal phthisis, where expectoration is difficult, and in children who do not expectorate. In children, tuberculosis primarily affecting the intestine is not uncommon; it is probably started by milk contaminated by the tubercular virus.

Symptoms.—Diarrhoea is the characteristic symptom of tuberculosis of the intestine in all its stages; before ulceration occurs the flux is easily controlled, and the early diarrhoea of phthisis is attributed to this cause. When widespread ulceration is in progress the diarrhoea is intractable; the stools are very fluid, yellowish, most offensive, and sometimes tinged with blood. There is abdominal pain, often severe, and generally localized patches of tenderness, most often found in the right iliac region; the tongue, at first red at the tip only, becomes red and glazed, and finally a brown streak forms down the centre. There is irregular but often severe pyrexia, also night sweating; exhaustion is great, and emaciation rapid. Diarrhoea is more severe and intractable when the colon is largely affected than when the ulceration is almost limited to the ileum.

Death, in the great majority of cases, is due to exhaustion, occasionally to perforative peritonitis, and still more rarely to hæmorrhage. In children, coincident tubercular peritonitis commonly has a large share in bringing about the fatal result. In less severe cases constipation may be a marked symptom, diarrhoea occurring only at irregular intervals, and then with great severity; in rare cases constipation is continuous, but, as a rule, the accumulation of solid feces irritates the ulcers and causes the attacks of diarrhoea.

Morbid Anatomy.—The tubercular new growth commences in the lymphatic tissues of the intestine, and, whether it arises in connection with a solitary gland or a Peyer's patch, extension takes place in the direction of the blood-vessels, probably in their lymphatic sheaths, and the resulting ulcer is therefore generally transverse to the long axis of the bowel. The tubercular process spreads laterally in the sub-mucous tissue; it also spreads into the muscular coat, and finally reaches the peritoneum, upon which tubercles then form; it also involves the mucous membrane, leading to destruction of limited areas. As intervening bands of mucous membrane remain at first, the tubercular plaque may have a cribriform appearance; in a later stage, which is that most commonly seen, the ulcer appears to be deep, owing to the tubercular infiltration of its edges, and the floor and sides are ragged. The floor of the ulcer is generally so much thickened by tubercular material that perforation does not occur, though the event is, taking a series of cases, by no means rare. Owing to the presence of adhesions, which form as the result of the tuberculosis of the peritoneum, the opening generally forms between two coils of intestine; even when extravasation occurs into the peritoneal cavity it is probably *guttatim*, the opening being a mere pin-point, and the acute peritonitis which ensues is commonly limited in extent, and has a conservative effect. The ulcers occasionally cicatrize, and have been known to cause chronic obstruction.

Tubercular ulceration is most common about the cæcum, but authorities differ as to whether the lower part of the ileum, the cæcum, or the colon is the earliest and the most severely affected. The mesenteric glands and lymphatics are always affected, but widespread tubercular peritonitis is seldom seen except in children or adolescents.

Treatment.—The diarrhoea is doubtless partly due to a catarrhal condition of the mucous membrane in the neighbourhood of the ulcers; the food should therefore be bland, and, to prevent overdistension of the blood, all articles which are prone to undergo decomposition, with the attendant production of flatus, should be avoided. When, from the history of the case and the presence of irregular fever with severe diarrhoea, it is probable that ulceration is in active progress, the patient should be kept warm in bed, and fed frequently with small quantities of animal broths and milk; the latter may be pre-digested, or koumiss may be given.

Poultices or turpentine stupes to the abdomen relieve pain; if there be localized tenderness, a small blister to that area will relieve it, and often check the diarrhoea. At the onset of an acute attack a dose (5j-ij) of castor oil in brandy and milk is recommended (Douglas Powell), preceded in some cases by a small dose of calomel (gr. $\frac{1}{2}$ -j). This is to be followed by bismuth subnitrate, or carbonate (gr. x-xx) combined with ipecacuanha (gr. $\frac{1}{2}$), or Dover's powder (gr. x). The use and the dose of opium must be governed by the amount of pain. Subsequently, if diarrhoea persist, vegetable astringents are of use. Tannic acid (gr. iv), logwood or fresh Indian bark may be given, but with these it will generally be necessary to combine opium. Sulphate of copper (gr. $\frac{1}{4}$ - $\frac{1}{2}$) in pill with opium (gr. $\frac{1}{2}$ -j) is a powerful astringent. In a few cases, sulphuric acid and opium is very successful. Pulv. kino co. is a convenient remedy. In the later and more chronic stages, where there is reason to suppose the large intestine to be much affected, enemata are often of great service, *e.g.*, enema opii B.P. with acetate of lead (gr. v), or tannic acid (gr. v), administered twice a

day. Some writers recommend larger enemata, preferably of linseed tea, to which tinct. opii (℥xxx-℥l) has been added; where this somewhat heroic remedy appears inappropriate, suppositories will often give satisfactory results (suppos. morphinæ B.P., suppos. plumbi co. B.P., suppos. acidi tannici B.P.). Constipation is best treated with small doses of castor oil (5j).

DAWSON WILLIAMS.

IODISM, is the condition produced by the administration of salts of iodine, and particularly the iodide of potassium. The symptoms only appear in certain individuals who show a special susceptibility to the action of the drug—*i.e.*, an idiosyncrasy. The most severe effects may follow the administration of a few grains, whilst they rarely come on in patients taking very large doses. Conjunctivitis, lachrymation, swelling of the eyelids, sneezing and nasal catarrh are early symptoms; the pharynx and gums become congested and salivation may result if mercury in any quantity be already present in the system. The patient complains of a nasty taste in the mouth, nausea, anorexia, frontal headache and tinnitus, and may have wandering neuralgic pains and palpitation. If the drug be not discontinued he gets depressed and suffers from insomnia, and eventually becomes emaciated and cachectic. Certain characteristic effects are produced on the skin which will be found fully described under the heading **MEDICINAL RASHES**. The symptoms usually soon subside if the drug be left off, but the severe bullous eruptions take some time to disappear.

ISCHÆMIA.—A synonym for local or partial anæmia; the ischæmic part when pricked does not bleed.

J

JAUNDICE (Icterus).—A yellow colour of the tissues and of certain secretions of the body resulting from the absorption of the colouring matter of the bile.

If the bile, instead of being poured into the duodenum, pass into the lymphatics of the liver, and thence into the general circulation, jaundice results.

It is usual to subdivide cases of jaun-

dice into two classes: (1) in which there is an impediment to the flow of bile into the duodenum, its retention in the biliary passages being followed by absorption and jaundice—*jaundice from obstruction*; and (2) cases in which there is no obvious obstruction—the so-called *jaundice from suppression or from suspended secretion*. It is, however, preferable to consider the subject from the point of view of the changes in the hepatic blood-

pressure and in the pressure within the bile ducts. It may be stated that the condition is in all cases due, either to (1) lowering of the blood-pressure in the liver, or to (2) a rise of pressure within the bile ducts.

The former of these conditions is observed in *icterus neonatorum*, which occurs in premature or very feeble children, where the sudden alteration in the course of the circulation produces changes in the intra-hepatic blood-pressure, and jaundice results; a similar condition may occur after the inhalation of chloroform. The production of jaundice in the latter case is probably also favoured by a rapid and excessive destruction of red blood-corpuscles which leads to a hypersecretion of bile.

The latter condition is fulfilled whenever there is *obstruction to the outflow of bile*, whether it arise from catarrhal swelling of the mucous lining of the common duct, from the presence of new growths in its walls or in the neighbourhood, which compress the duct, and either narrow or occlude its lumen, or from the presence of foreign bodies, calculi or parasites, or from cicatricial or congenital occlusion of its opening into the duodenum.

The factors which determine the flow of bile into the duodenum are (1) the pressure of the newly formed bile forcing onward the contents of the excretory ducts; (2) the interrupted compression of the liver by the diaphragm at each inspiration; and (3) the contraction of the gall bladder under nervous influences (Landois and Stirling).

All cases of jaundice must be ascribed to one or other of these conditions, or to both combined. The jaundice of *fright* or *rage* is to be attributed to lowering of the blood pressure under nervous influence. In *yellow fever* and *septicæmia* to excessive formation of bile owing to increased destruction of red blood corpuscles combined with a lower blood-pressure. In some diseases, as in *acute yellow atrophy of the liver*, we are not in a position to state precisely how these factors determine the jaundice, we only know that there is no obstruction to the outflow of bile, so that we may infer that lowering of the blood-pressure in the liver favours its entrance into the lymphatics. The early and rapid destruction of the liver cells prevents the supposition of an excessive secretion of bile, but the diffused yellow appearance of the liver shows that the bile has entered the lymphatics.

ROBERT SAUNDBY.

JAUNDICE, CATARRHAL.—Catarrh of the mucous lining of the common bile duct is most often secondary to catarrh of the duodenum, a condition which is usually due to an extension of catarrh from the stomach. The latter affection may follow errors of diet, the abuse of alcohol, catching cold, long-standing heart disease, pregnancy, enteric fever, pneumonia, Bright's disease, lithæmia, excessive tea-drinking, or malarial fever.

Primary catarrh of the bile ducts occurs in acute phosphorus poisoning, perhaps in some of the conditions above named, and from the presence of irritating foreign bodies—*e.g.*, calculi and parasites.

It occurs equally in both sexes, but more often in young persons.

Symptoms.—The symptoms necessarily vary with the ætiology of the affection and the different concomitant conditions that may be present. In ordinary simple catarrhal jaundice, however, such as occurs not infrequently in young persons, they are fairly uniform. The attack commences with considerable malaise, loss of appetite, furred tongue, bad taste in the mouth, headache and constipation. There may be also some sense of weight in the right hypochondrium. In three or four days the conjunctivæ are tinged yellow, and before this the urine contains bile pigment.

This can be recognized by the eye alone, but should be tested by diluting the urine in a glass to the colour of pale sherry and adding nitric acid, containing a certain amount of nitrous acid (as it always does after keeping a short time, when it turns a yellow colour) or some diluted liq. iodi (1 part to 10 of water), when a bright green colour makes its appearance if bile pigment be present, or some of the urine may be allowed to mix slowly with nitric acid on a white surface, such as a plate, when if bile pigments (bilirubin) be present a play of colours from green to red and violet is observed; this is known as Gmelin's test. The green is the only colour which really indicates the presence of bile pigment, as the red and violet tints are also produced by the presence of urobilin and indican in the urine.

The liver area is enlarged below the costal margin, there is often tenderness over it, and the gall-bladder may be felt just outside the edge of the rectus abdominis muscle. The stools are pale, clay-coloured and of stiff consistence; if the occlusion of the duct be complete they may be as white as curd. The pulse

is slow, probably owing to the poisonous action of the bile acids on the heart. The temperature is normal or subnormal.

Yellow vision, or "*xanthopsia*," sometimes occurs. Pruritus is often very troublesome.

The disease lasts from two to four weeks or longer. An attack of catarrhal jaundice may favour the occurrence of gall stones; and in rare cases, if long continued, may lead to general dilatation of the bile ducts or even to suppuration, and multiple small abscesses may form in the liver.

Diagnosis.—The first indication is often the appearance of bile pigment in the urine, which may be discovered even before there is any tinge of yellow in the conjunctiva or skin.

At one time some diagnostic importance was attached to the discovery of bile acids, but owing to the uncertainty of Pettenkofer's test (a purple colour with sugar and sulphuric acid) little attention has of late been paid to it. A new and very simple test has been lately suggested (M. Hay) by which results of some value may be obtained. A few grains of precipitated sulphur are sprinkled on the surface of the urine, when, if the bile acids be present, the sulphur floats, instead of sinking, as it ordinarily does. It has also been suggested (Oliver) to employ a solution of peptone, which gives a precipitate with these acids. The other diagnostic points worthy of notice are, the age of the patient, the absence of pain and the associated pathological conditions.

Prognosis.—The duration of the disease is, as has been said, from two to four or more weeks, and the prognosis is always favourable unless the condition be dependent upon some grave organic condition, such as heart disease. As a complication of pneumonia it is not a cause for alarm.

Post-mortem appearances.—In simple catarrh of the bile ducts these are not well-marked. The mucous lining is slightly swollen, and the bile in the passages may be mixed with mucus. The gall-bladder may be found distended with bile. The liver is slightly enlarged and bile stained. The stomach and duodenum present the signs of acute or sub-acute catarrh, more or less injection, and swelling of their mucous lining,

which is thickly coated with turbid mucus.

In acute phosphorus poisoning it is the smaller ducts which are the seat of the catarrh, and the gall-bladder and secretory ducts may be nearly, or quite empty, while on microscopical examination the small ducts are found to be plugged with desquamated epithelium.

In catarrh due to foreign bodies the tissue changes in the large ducts are more marked, and often accompanied by ulceration.

In very chronic cases of catarrhal obstruction the bile ducts above the obstruction become dilated and filled with bright yellow muco-purulent fluid. The liver is much swollen, stained with bile, and the walls of the gall-bladder are cedematous.

Treatment.—The general management of catarrhal jaundice involves rest in bed, milk diet, and sinapisms to the epigastrium. The free administration of mercurials at night, followed by saline purgatives in the morning, is, on the whole, the most successful method of treatment. If there be much gastric catarrh, the following remedies should be employed:—*R* Hydrarg. subchlor. gr. j, sacch. alb. gr. v; fiat pulvis, mitte duas. Sig. One to be taken at bedtime on two following nights. *R* Bismuthi carb. gr. x, sodii benzoatis gr. x, pulv. rhei gr. ij., pulv. cinnamomi co. gr. v; fiat pulvis, mitte duodecim. Sig. One to be taken thrice daily in a little milk before meals. The bismuth powders should be continued till the gastric catarrh is relieved, and the calomel may be repeated at intervals of a week. Where there is no very obvious gastric catarrh, the following mixture will suffice:—*R* Sodii benzoatis, ʒij, inf. gentiani ʒvj; misce. Sig. A tablespoonful three times a day before food. And if there be any constipation this pill may be given at bedtime: *R* Euonymini gr. j, ext. aloes gr. ij, pulv. ipecac. gr. ʒ; misce ft. pil.; mitte sex. Sig. A pill to be taken at bedtime.

A tumblerful of hot water should be sipped every morning, in which a teaspoonful of Carlsbad salts have been dissolved, or a tumblerful of Vichy water (Célestins or Haute-Rive) may be taken twice a day with lemon juice.

ROBERT SAUNDY.

K

KIDNEY, ABSCESS OF.—A collection of pus within the substance of the kidney.

Abscess of the kidney may show itself as one or more large collections of pus, usually limited to one organ, or as numerous small abscesses distributed through the substance of both glands. The latter is the variety usually associated with pyæmia.

Symptoms.—The pyæmic abscesses give rise to no definite symptoms during life which could lead to their diagnosis in the midst of the other severe symptoms of the pyæmic state. They would in most cases cause albuminuria, but this would also result from the general febrile condition. The symptoms about to be described are, therefore, those of the larger variety of abscess.

Before the advent of the suppuration the patient presents the signs of a simple acute inflammation. A feeling of heaviness and pain in the loin is complained of, tenderness is observed when pressure is applied over the kidney, while there is more or less rise of temperature together with the other usual signs of fever.

The urine is scanty and high coloured, depositing urates on standing, and it may sometimes contain blood, or albumen. The onset of suppuration is indicated by the occurrence of rigors, and sometimes by profuse perspiration. The temperature becomes higher and more variable, assuming the characteristics of the hectic state. In the loin, on the affected side, pain and tenderness are more acute. A distinct bulging may be seen, and, as the abscess increases in size, a fluctuating swelling may be felt in the usual situation of the kidney. It is to be noted that in certain cases the onset, and even the whole course, of the abscess, may be latent and unaccompanied by any definite symptoms.

The abscess may attain a considerable size, but its further course is variable. It often bursts into the surrounding parts. The most favourable course which the pus can take is to make its way into the pelvis of the kidney. Large quantities of pus are then discharged with the urine, the swelling in the loin diminishes in size, and after a time recovery takes place. A less favourable event is for rupture to take place into

the intestine; pus is discharged with the feces, but the suppuration is apt to be prolonged. Rupture into the peritoneum is fatal.

The pus may also find its way into the perinephritic tissue, constituting a perirenal abscess, and may thence burrow to distant parts, at length opening externally. The abscess may also open directly on the external surface, usually in the loins, and it has been known to extend into the thoracic cavity, discharging itself into the pleura, or through the lungs into the bronchi. All these results, however, are unfavourable; prolonged suppuration ensues, with gangrenous sloughing of the parts over which the pus flows and the patient at last dies from exhaustion.

There remain to be mentioned two issues of the abscess which are unfortunately rare. The pus may be entirely absorbed and nothing be left but a firm fibrous cicatrix. Again, the pus may become inspissated and the abscess wall shrunken, leaving a cheesy mass surrounded by a thick capsule of fibrous tissue; calcareous salts may in time be deposited in the cheesy material. Either issue is of course favourable to the patient.

Diagnosis.—In the absence of a definite tumour the diagnosis must be based upon the presence of pain and tenderness in the loin, together with fever of a hectic type, rigors, and sweatings. When a tumour has appeared, fluctuation will determine its cystic nature, while the general symptoms of suppuration will distinguish it from other like formations in the kidney. The distinction between an abscess in the kidney and one outside the organ will be found in the article on PERINEPHRITIS. (See also ABDOMINAL TUMOURS, DIAGNOSIS OF.)

Ætiology.—Suppuration in the kidney may be caused by blows on the loins, or by crushing and laceration of the renal substance, as in buffer accidents. It has been known to occur after the exhibition of irritant drugs, such as cantharides and turpentine. It may be set up by the presence of a tumour or tuberculous material, or of a calculus in the kidney substance. Suppuration is, again, the result of the lodgment of an irritating or septic embolism in the kidney, as

occurs in states of general pyæmia and in some forms of ulcerative endocarditis. Further, abscess formation is one of the manifestations of the so-called surgical kidney, the ætiology of which is discussed under that heading.

Pathology.—A large abscess may be, from the first, solitary, or may result from the amalgamation of several miliary abscesses. It shows itself as an irregular cavity, occupying more or less of the kidney substance, having ragged walls formed by pulpy and degenerated renal tissue, and is occasionally bounded by the capsule of the organ. Its contents are pus, mixed with blood and the detritus of the destroyed gland tissue.

The pyæmic abscess appears in the early stages as a wedge-shaped area of greyish colour, situated in the cortex of the kidney, with the base at the periphery of the organ. The area is from the first somewhat softened and is surrounded by a zone of hyperæmia. In a short time suppuration takes place, the area now becomes more globular than wedge-shaped, and is still surrounded by a zone of hyperæmia. Later on a more or less firm capsule of fibrous tissue limits the abscess.

Microscopically, there is seen in the early stages coagulative necrosis of the renal cells, and collections of micrococci can, by suitable staining processes, be demonstrated in the glomeruli and in the larger blood-vessels of the affected part. Sometimes streaks of purulent infiltration are present in the pyramidal portion of the kidney, running along the course of the vasa recta.

Pyæmic abscesses are the result of infective emboli which reach the kidney from some distant septic focus, and block portions of the renal vascular system. The smaller abscesses may coalesce by the breaking down of the intervening walls, and so produce one large abscess. Moreover, in ulcerative endocarditis the infective embolus may be of a sufficient size to block a considerable branch of the renal artery, and then the resulting abscess may be large from the first. Pyæmic abscesses may heal by inspissation of the pus, or by absorption of the pus and the formation of fibrous tissue by the surrounding parts. Finally, nothing may be left but a small fibrous cicatrix, which occupies the position of the destroyed kidney substance. The suppuration caused by tumours and calculi is localized to the vicinity of the irritating body.

Treatment.—The patient should be

kept at rest in bed, and on light fluid diet. The bowels should be maintained freely open by enemata or a mild saline purge. In the early stages, wet cupping, or the application of leeches to the loins, may be employed with advantage, and will occasionally avert the more serious symptoms. Poultices or hot fomentations to the loins will help to relieve the pain and tension, but opiates may be necessary to obtain rest and ease. As drugs, febrifuges are indicated, the citrate and acetate of potash in half-drachm doses, and the liquor ammonii acetatis being the most useful.

When distinct signs of suppuration have appeared, quinine should be administered freely. If the abscess has ruptured, the strength should be maintained by a full diet, stimulants, and the various preparations of bark, in order to ward off as much as possible the effects of prolonged suppuration. The untoward results of leaving the abscess to work its own discharge must be remembered. Therefore, whenever it is certain that pus has formed in the kidney, it should be let out by an incision in the loin, and the abscess cavity drained. It is quite justifiable also to make an exploratory incision when suppuration is suspected but not absolutely determined.

ROBERT MAGUIRE.

KIDNEY, CYSTS OF.—Cysts occur in or near the kidney under a variety of conditions.

1. Cysts are found with great frequency in connection with granular kidney. They are due to obstruction to the renal passages by the fibrosis of the organ, and their anatomy is described elsewhere.

2. In otherwise healthy kidneys it is not uncommon to find cysts of variable size, but rarely larger than a walnut, filled with usually diffuent, sometimes gelatinous, material. They rarely give rise to symptoms, but may occasionally attain such a size as to constitute an important abdominal tumour. They are probably due to obstruction of a renal tube, the cause of which is, however, unknown.

3. **Congenital Cystic Degeneration.**—As a congenital condition, both kidneys are occasionally found riddled with cysts, which seem to have taken the place of almost the whole of the secreting structure. The kidneys are greatly enlarged, and may constitute an obstacle to delivery. The cysts are lined by tessellated epithelium, and are surrounded

by fibrous tissue and by a certain amount of renal tissue.

The fluid contained in the cysts consists of urine, together with albumen, blood, fat granules, and cholesterin. It may be quite colourless and transparent, but more often is cloudy, and coloured brownish-red or yellow. The renal artery in connection with such a cystic kidney has been shown by Rindfleisch to be much narrowed.

Often other malformations of the genito-urinary organs and other parts are found; and if, as occasionally happens, cystic kidney be present on one side only, the other malformations are also limited to that side.

Pathology.—The cysts are due to obstruction and distension of the urinary passages. The cause of such obstruction has been variously explained. Virchow asserted that the occlusion of the tubes was produced by inflammation of the papillary ducts from the impaction of uric acid or urates in the straight tubes. Köster, on the other hand, shows that the tubuli uriniferi may not establish their normal communication with the renal pelvis, which is formed from the Wolffian duct, and so may remain impervious. Thorn believes that inflammation of the ducts may spread from the pelvis and calices of the kidney, and so cause occlusion; while Chotinsky has found that proliferation and accumulation of epithelial cells may block the tubes. Bland Sutton has recently suggested that it is not the uriniferous tubes which are dilated, but remains of the Wolffian duct.

A considerable degree of this affection is incompatible with life. As to how far a minor degree may persist to adult age is not known; but such a persistence may possibly be a cause of the form next to be described.

4. Cystic Degeneration of Adults.—In adults both kidneys are sometimes found converted into immense masses of cysts, occasionally, strange to say, without any definite symptoms having been presented during life. Both kidneys are always affected, though not necessarily to the same degree. The cysts vary in size, from a pin's head to an orange. Their walls are lined by flat epithelium, and the fluid within them is either a gelatinous substance or a clear, yellowish liquid. The fluid contains albumen, cholesterin, phosphates, uric acid, creatine, and occasionally other urinary ingredients. The cysts are imbedded in a mass of fibrous tissue, in which but little of

the true secreting parts is to be found. The lower urinary passages are generally healthy.

The cysts have been thought to be dilated Malpighian capsules, but are probably renal tubes, which have become distended in consequence of obstruction to their lumen. The obstruction has probably a similar origin to that occurring in the congenital form.

It would appear that in a large number of cases the interstitial fibrosis is the primary lesion, as in the cysts which accompany granular kidney. Possibly in some cases blood clot may cause the obstruction of the urinary tubes.

Symptoms.—The symptoms may be entirely absent; they are rarely very distinctive, and are always chronic in their progression, and are practically those of chronic Bright's disease. The urine is commonly of low specific gravity and often contains albumen and blood. The heart may be hypertrophied and symptoms of chronic uræmia, such as vomiting and nausea, headache and delirium, may present themselves. In the final stage if death occur from the kidney affection there are manifestations of uræmic coma and convulsions, which not unusually are sudden in their onset. In spite of the increased size of the kidneys it is not always possible to feel them during life through the abdominal wall. They lie deep down in the lumbar regions, completely filling up the hollows on each side of the vertebral column.

Treatment.—The treatment must be that of chronic Bright's disease, with which, both pathologically and clinically, the disease has great similarity.

5. It is sometimes observed after death that the kidneys, together with the liver and sometimes the spleen, are the seat of numerous cysts of about the size of a pea. The organs are not more than slightly enlarged. The nature of the cysts is not yet precisely known; in some instances they appear to be dropsical distensions of the epithelial cells, in others to be mere spaces in the tissue, filled with serous fluid. They must be distinguished from a similar change which is sometimes the result of putrefaction. No symptoms have as yet been connected with this condition.

6. Para-renal Cysts are occasionally seen which take their origin outside the kidney, although they may eventually communicate with its interior. Their origin is unknown. They are but rarely so large as to be of clinical importance.

7. Hydatid Cysts are described under the head of KIDNEY, PARASITES OF.

ROBERT MAGUIRE.

KIDNEY, MISPLACED.—The kidney is liable to be displaced from its normal position by the pressure of tumours or of inflammatory exudations. Such a displacement has in itself no clinical importance.

As a congenital condition the kidney may occupy a position lower or higher than is normal, and sometimes both kidneys may be situated on the same side of the abdomen.

Of these misplacements the most common, and also the only one which has any clinical interest, is the misplacement downwards. In the foetus the kidneys lie near the bifurcation of the aorta, and occasionally one of them remains in this position even in adult life, most commonly resting on the sacro-iliac synchondrosis. The renal artery has a similar low origin, arising from the aorta near its bifurcation, or from the common iliac artery or from the middle sacral artery. The vein also enters the inferior vena cava at a corresponding level.

The vessels and ureter not infrequently show abnormalities of number. The kidney itself lies somewhat obliquely, and has a more or less abnormal configuration. The supra-renal body of that side occupies its normal site, but congenital malpositions of the intestine or peritoneum may be present. The condition is the more common in men, and most frequently it is the left kidney which is misplaced.

The clinical importance of this condition lies in the fact that, from its prominent situation, the kidney may be mistaken for an abdominal tumour. It is on record also that such a kidney lying in the pelvis caused an obstacle to parturition. The size and elastic feel of the mass, possibly its renal shape, the sickening feeling produced by pressure, the apparent emptiness of the normal site of the kidney, the presence of the supposed tumour on the left side, and the male sex of the patient, will serve to establish the diagnosis.

Another congenital deformity, the **Horseshoe Kidney**, may occasionally give rise to pathological changes. In this condition the two kidneys are joined together, generally at the lower, but sometimes at the upper, end by a connecting band, which is composed either of true renal substance or of firm fibrous tissue. The kidneys are lower

in the abdomen and nearer the vertebral column than is usual, and there are always found abnormalities in the distribution of their blood-vessels. The connecting band may be felt during life and mistaken for a tumour. Any disease, such as pyelitis attacking such kidneys, would be accompanied by an unusual localization of the physical signs. One case is on record in which a congested horseshoe kidney pressed on the inferior vena cava and caused thrombosis and death.

ROBERT MAGUIRE.

KIDNEY, MOVABLE (Floating Kidney).—A condition in which the kidney is no longer fixed in its normal position, but is capable of displacement over a certain area of the abdomen, under the influence of its own weight or of the respiratory or other movements.

Symptoms and Signs.—When the abdomen is examined, unless the kidney be for the moment occupying its normal position, it can be felt as a firm elastic body of the peculiar renal shape, which can be moved more or less freely, and slips from under the hand with an ease which is characteristic. The movement of the kidney may be very limited, or, on the other hand, may extend over an area of several square inches. The normal position of the kidney feels empty, and is more resonant on percussion than is usual. In most cases the kidney can readily be replaced, but in others it seems to have contracted adhesions which retain it more or less firmly in its unwonted site. The normal bed of the kidney, too, is liable to become filled up with fat, which hinders the replacement of the organ.

After replacement, a deep inspiration or certain movements frequently known to the patient, such as the raising of the lumbar region on turning to the opposite side, will again displace the kidney. On pressure, a sickening sensation is experienced. During menstruation the organ becomes larger and more tender than at other times.

There may be no symptoms whatever to attract attention to the condition. Usually, however, some pain is complained of in the loin of the affected side. The pain is aching and dragging in character, sometimes severe and shooting, and it may be accompanied by neuralgic pains in other parts of the body. The pain is worse when the patient stands or moves, and is relieved or disappears when the recumbent position is assumed.

Dyspepsia, epigastric pulsation and irregularity of the bowels, at one time diarrhoea at another constipation, are common symptoms. Frequency of micturition has been sometimes noted. The aching pain and consciousness of the abnormality after a time induce a condition of hypochondriasis.

While the symptoms usually complained of are vague, there occur at times paroxysms resembling those of renal colic, during which the patient suffers great pain, radiating from the kidney downwards in the direction of the ureter, and accompanied by vomiting and faintness. The displaced kidney during this attack is swollen, tender, and less freely movable than it was before. Such paroxysms are induced by excessive exercise or an indigestible meal, and are specially liable to occur at the menstrual periods. The urine during one of these attacks may contain blood or pus, whereas its usual condition is normal.

Edema of the lower limbs, from pressure of the displaced organ on the inferior vena cava, has been observed. Jaundice also may occur from pressure on the bile duct. No alteration in the composition of the urine can be observed, as a rule; but the pyelitis, which may appear as a transient phenomenon during the paroxysmal attacks, occasionally becomes permanent, and pus will then be found in the urine.

Pathology.—It is sometimes found that the peritoneum, which ordinarily passes only in front of the kidney, actually envelops it, so as to produce a mesonephron. This is a congenital condition, and it allows of a movement of the kidney, which is only restrained by the attachment of its vessels. But any process which loosens the kidney from its bed, or diminishes the support it receives from the other abdominal contents, will tend to produce undue mobility. Thus, blows on the kidney region, muscular strains, absorption of the peri-renal fat, a swelling of the kidney from any cause, with subsequent reduction in size, and the lax condition of the abdominal walls which is induced by repeated pregnancies, are the most usual precedents. Tight-lacing, too, has been recognized as a cause, and it has been suggested that undue heaviness of the kidney from congestion during the menstrual periods may cause the organ to leave its place and stretch its supports.

The condition is more frequent in females, and in the greater number of cases is situated on the right side. It

has been suggested that the term "floating kidney" should be reserved for those cases where a distinct mesonephron is present, and all other cases designated by the term "movable kidney."

The nature of the paroxysmal attacks described is not yet clear. They may be due to pressure of the kidney upon the nerves which surround it, or to a twist of its pedicle, which would cause strangulation of its vessels or of the ureter.

The movable kidney is liable to be attacked by disease, as is the normal organ. Inflammation around it may bind it in a new position. It has been found to show the condition of granular kidney. Pyelitis is not infrequent, and extension of suppuration to the body of the organ has caused death. Hydronephrosis has been met with in a certain number of instances, and is probably due to a bend and obstruction of the ureter when the kidney is displaced downwards.

Diagnosis.—The diagnosis of movable kidney is easy. Its peculiar mobility, its shape and elasticity, the ease with which it can be pressed into and out of the lumbar space, and the emptiness and comparative resonance of the lumbar space when the tumour is felt in the abdomen, are signs which in most cases are easily detected, and at once suggest the nature of the condition. (See ABDOMINAL TUMOURS, DIAGNOSIS OF.)

Treatment.—If, as frequently happens, no very distressing symptoms be associated with mobility of the kidney, no treatment whatever is required. But the hypochondriasis and neuralgic pains sometimes render life a burden, and hinder the patient from undertaking any active duties. If this be so, an attempt should be made to retain the kidney in its place. This, in a few instances, may be effected by a simple abdominal bandage to give support to the walls, and a pad over the front of the kidney region. The bandage and pad should be applied while the patient is in the recumbent position. An india-rubber belt with an air pad over the kidney, as recommended by Dr. Newman, is even more effective. For more intractable cases Dr. Dickinson has found a spring truss, to press on the kidney region, very serviceable, but its pressure cannot always be borne.

If all these appliances fail, and the symptoms are still distressing, the kidney may be fixed in its normal position by the operation of nephrorraphy, in which

the kidney is stitched to the posterior abdominal wall through a lumbar incision, and is afterwards retained in its position by inflammatory adhesions. The results of this operation, as at present observed, are, however, not very encouraging, as in several cases the organ has again become movable. Excision of the kidney has been recommended as a last resource, but is too dangerous, and should not be advised.

The bowels should be maintained in a state of regular activity. If there be anæmia and lassitude, iron and other tonics are indicated. Violent exercise is to be forbidden and also such movements as have been found to occasion the displacement should be avoided.

During the paroxysmal attacks absolute rest in bed must be maintained, poultices and other anodyne applications should be used to alleviate the pain in the displaced kidney, and opiates administered by the mouth or subcutaneously.

ROBERT MAGUIRE.

KIDNEY, PARASITES OF.—

I. **HYDATIDS.**—The cystic condition of the tænia echinococcus, is the most common parasite of the kidney in England. It is nevertheless rarer in this organ than in the liver and lungs.

The left kidney is the more frequently the seat of the parasite, possibly owing to the fact that as the liver is so frequently the host of the hydatids a larger proportion of embryos travelling from the intestine are free to attack the kidney on the left side than on the right.

The cyst may be small or may attain the size of a man's head. It is lodged in the substance of the kidney, or may in some instances lie between the capsule and the organ itself. In either case, as its size increases, atrophy of the kidney substance is caused from pressure. The structure of the hydatid cyst is described in the article upon **HYDATID DISEASE**. Men are more liable to hydatids of the kidney than women. The mean age at which they make their appearance is thirty-four years.

Symptoms.—A small cyst may exist without any symptoms whatever being observed.

As the cyst increases in size it forms a tumour in the lumbar region, tense, elastic, sometimes fluctuating and presenting all the evidences of a tumour of the kidney already described. It is to be noted that the colon does not always lie over the front of the hydatid cyst, but may be on either the inner or

the outer side. The viscera of the neighbourhood may be displaced by the increasing size of the cyst.

The cyst sometimes, when percussed, communicates to the hand or stethoscope laid upon it the peculiar vibration termed the "hydatid fremitus," which is, however, probably nothing more than the vibration of a tense cyst wall.

Local pain and tenderness, which are usually absent, are nevertheless sometimes produced by inflammation of the surrounding tissues. Such inflammation causes transient pyrexial attacks, and occasionally passes on to suppuration.

The symptoms above described are merely those of any other cystic formation in the kidney. The hydatid cyst, however, shows a great tendency to make its way towards the pelvis of the kidney and to burst into the urinary passages. This it effects the more readily if it be originally situated in the pyramidal portion of the organ; after a longer time, if localized in the cortex or outside the kidney. By this peculiarity, symptoms are occasioned which are characteristic of the disease. The passage of the daughter cysts contained in the parent sac down the ureter, gives rise to the phenomena of renal colic, similar to those accompanying the descent of a calculus—pain in the course of the ureter, in the groin and the inside of the thigh, retraction of the testicle, vomiting and retching, with sometimes rigors.

These symptoms subside when the small cyst has reached the bladder, but when the cyst afterwards attempts the passage of the urethra it causes blocking of the canal, with frequent efforts at micturition, pain, and retention of urine, until at last it is expelled, often with some force. The urine passed at the same time may contain blood or pus. Not unfrequently the cyst ruptures in its transit, and there is then discharged from the bladder shreds of hydatid tissue, hooklets and fat globules. The symptoms recur at irregular intervals as more cysts proceed down from the kidney.

The rupture of the parent cyst is sometimes determined by an injury to the side or a sudden exertion. The discharge of vesicles often causes a notable diminution in size of the tumour in the loin, while, again, renal distension may ensue upon obstruction of the ureter by a passing cyst.

Results.—In the majority of cases recovery ensues, the contents of the parent cyst being discharged into the urinary passages. The cyst has also

been known to rupture into the lung and into the intestines, but never into the peritoneum. The sac may itself suppurate or may cause suppuration in the surrounding parts; further, the hydatids may die and the sac shrivel up into a cheesy or even cretaceous mass containing numerous hooklets.

Diagnosis.—When the cyst is intact it can hardly be diagnosed with certainty. Its signs are those of any other cyst of the kidney, except that the colon is more irregularly placed than is the case with other cysts. It most nearly resembles a hydronephrosis, but the history of any possible obstruction to the ureter, which would cause a hydronephrosis, is of course wanting. In obscure cases puncture of the cyst may be practised, not only for purposes of treatment, as is mentioned below, but also to establish the diagnosis. If the fluid withdrawn contain hooklets, or be free from albumen and rich in chloride of sodium, the nature of the cyst is obvious.

When a tumour in the loin is accompanied by the presence of hydatid elements in the urine, no difficulty will be experienced. The urinary appearances may, however, be present without a tumour in the loin, and then the kidney can only be diagnosed as the origin of the hydatids after the pelvis and inguinal regions have been carefully explored with a negative result, or when pain in the loins or nephric colic has been experienced.

Prognosis.—The prognosis is usually favourable, especially if the cyst have ruptured into the urinary passages. Rupture into other parts may be followed by suppuration or gangrene, leading often, but not necessarily, to a fatal result.

Treatment.—It has been suggested on various occasions that hydatids of the kidney might be destroyed by the internal use of drugs, such as turpentine, iodide of potassium, nitre, &c.; but such medicines, in the cases where good effects have seemed to follow their use, have probably acted only as diuretics and not as vermifuges.

When the cyst has ruptured, the pain accompanying the passage of the vesicles along the ureter should be allayed by the various remedies for renal colic—anodynes, warmth, and diluents. The vesicle has been assisted in its course by a kneading of the ureter in the direction of its length. The catheter may be required to relieve obstruction to the urethra.

Should the cyst remain unruptured its cure may be attempted by tapping, either with the aspirator or a syphon-tube. The removal of only a small amount of fluid often suffices to cause the death of the parasite and the ultimate obsolescence of the sac. Should these means fail, the sac should be exposed, an incision made, and the edges stitched to the wall of the abdomen, the operation being, if possible, performed in the loin.

II. *BILHARZIA HÆMATOBIA.*—This worm, known also by the names of *Distoma Bilharzii* and *Distoma Hæmatobium*, is a common parasite of the urinary organs in hot climates.

It is probable that fresh-water molluscs and fish are the hosts of the parasite during its transition stages from the embryo to the adult worm.

To the description of the parasite already given under the above heading (*q.v.*) it need only be added that the worm gains access to the body of man by means of drinking water, or fresh vegetables which may contain the animal itself, its embryo or the ova. Possibly, too, it may attach itself to the skin of a person bathing in infected water, and so reach a superficial blood-vessel.

The special habitat of the parasite in the body of man is the small veins, particularly those of the portal and urinary systems. In the bladder, ureter and kidneys it gives rise to extensive mischief. On the mucous surface of the bladder it produces ecchymotic patches slightly raised above the general surface, sometimes covered by a greyish membrane or by tough mucus. Nodular enlargements, over which the mucous membrane is intact, are also found. Covering the patches a mass of debris is frequently seen, consisting of the ova of the parasite, mingled with a deposit of uric acid and other urinary salts. Such an accumulation of eggs and urinary concretion is occasionally the cause of a distinct vesical calculus. In the kidney the presence of the parasite sets up severe pyelitis, and the calibre of the ureter may be narrowed. In certain cases by a combination of these two conditions the kidney has been converted into a mere sac of pus.

Symptoms.—The special symptoms produced are those of severe cystitis or pyelitis, and a recurrent hæmaturia (endemic hæmaturia). Such symptoms being observed, the diagnosis of their cause may be made when the eggs of the worm are found as a urinary deposit.

The free embryos, and the emptied egg-cases from which the embryos have escaped, also make their appearance in the urine.

Treatment.—Dr. Harley recommends that a morning draught be given containing oil of turpentine and male fern (of each mxxv), with mij of chloroform and ʒij of tragacanth mixture. Bicarbonate of potash in freely diluted solution is of use to relieve renal irritation and to facilitate the breaking up of concretions. Injections into the bladder of a solution of iodide of potassium (20 to 30 grains in 5 ounces of tepid water) used every second or third day were found beneficial when the parasite was specially localized in the walls of the bladder. As prophylaxis it is recommended that drinking-water should be filtered, and all salads or uncooked molluscs and fish avoided (*see also* BILHARZIA).

III. *FILARIA SANGUINIS HOMINIS*.—The effects of this worm are described in the articles upon *FILARIA* and *CHYLURIA*.

IV. *STRONGYLUS GIGAS*.—This worm is of extreme rarity in man, and is only found in the kidney.

It is a nematoid worm, resembling closely the *ascaris lumbricoides*. It is, however, much longer, the male being nearly a foot in length, and the female nearly a yard. It is also redder in colour than the round worm, and has six papillæ round the mouth. The symptoms produced by it are unknown.

V. *PENTASTOMA DENTICULATUM*.—This small parasite has only been found once in the urinary organs of man. It is encysted and club-shaped, and gives rise to no symptoms.

VI. *COCCIDIUM OVIFORME*.—A few instances have been described in which this parasite presented itself in the form of psorospermial sacs in the kidney and in the mucous membrane of the pelvis and ureter. It is not known if its presence causes any symptoms (*see* PSOROSPERMIE).

VII. *ERRATIC WORMS*.—Various parasites from the intestine, such as the thread-, round-, and tape-worms, occasionally obtain access to the urinary passages, and are discharged in the urine.

ROBERT MAGUIRE.

KIDNEY, TUBERCLE OF.—Tubercle may affect the kidney in three different ways, as—1. Miliary Tuberculosis; 2. Caseating Tubercle; and 3. Tubercular Pyelitis, leading to Pyelonephritis.

Symptoms.—Miliary tuberculosis, as a rule, gives rise to no symptoms by which it can be diagnosed.

The symptoms of caseating tubercle and of tuberculous pyelitis are, for practical purposes, identical. In the early stage there is pain in the lumbar region of one or both sides, often shooting downwards in the course of the ureters. The urine contains pus, and occasionally a little blood. In exceptional cases, hæmaturia may be a prominent symptom at the beginning of the disorder. Frequency of micturition is an early and characteristic symptom; and when this is combined, as is sometimes the case, with pain in the region of the bladder, a suspicion of the presence of vesical calculus may easily arise. Yet both these symptoms may be entirely independent of any affection of the bladder itself.

When the disease is fully developed the urine is feebly acid, and contains a large quantity of pus, with often a little blood. On standing for a short time the urine yields a deposit, consisting of pus corpuscles, blood corpuscles, a quantity of granular débris. When the pelvis of the kidney or the ureter is affected and the disease therein has not proceeded very far, a number of epithelial cells of irregular shape, which have desquamated from the mucous membrane of those parts, may sometimes be found.

When appropriately stained, the deposit may be shown to contain tubercle bacilli. The writer, however, would point out that it is by no means so easy to demonstrate the bacilli in urine as in the sputum from a phthisical lung. Possibly this is due to the extreme chronicity of the tuberculous process in the kidneys, and the consequent scanty discharge of bacilli into the urine.

Hyaline and, occasionally, granular casts are deposited. Albumen, too, is present in the urine, but not usually in much greater amount than the co-existent pus will account for.

The quantity of urine excreted may be normal or somewhat diminished, but it has been known to be large, and the urine is then of diminished specific gravity. Occasionally, too, while the urine, at ordinary times, presents the abnormal signs enumerated above, it happens that, for short periods, it becomes limpid, copious, non-albuminous, and gives no deposit after standing. Doubtless, these variations are indicative of a unilateral affection, the ureter of the diseased side becoming occasion-

ally blocked, and thus permitting the passage of an unmixed secretion from the opposite normal, or possibly hypertrophied organ.

Even when tubercle is limited to the kidney itself, the enlarged organ may be felt in the lumbar region on deep pressure. Tenderness in the same region can nearly always be elicited. But when tubercle has attacked the renal pelvis and pyonephrosis is established, the customary sign of this condition—painful, tender and obscurely fluctuating tumour in the flank—is manifest. The tumour may vary in size coincidentally with changes in the character of the urine.

Meanwhile, constitutional symptoms of tuberculosis, albeit but ill-marked in the early stage, become more and more evident. Hectic fever with chills, rigors, frequent and feeble pulse, and great emaciation are added to the symptoms already described. There may have been, at the first appearance of kidney trouble, evidence of tubercular disease in the lungs of old standing, but even when the kidney disease has apparently been primary in origin the lungs and the alimentary canal in the advanced stages of the affection often show signs of secondary infection.

Destruction of kidney substance, or obstruction to both ureters, may cause death from uræmia. The end may also be induced by exhaustion from prolonged suppuration. Further, a complication, such as an affection of the lungs or intestines, spread of the kidney affection to neighbouring parts, or rupture of an abscess into the peritoneum, may destroy life.

Diagnosis.—The symptoms of chronic tuberculosis are mainly those of pyelitis, and the question of diagnosis is as to the cause of the pyelitis. The presence in the urine of granular debris, caseous masses, connective tissue or elastic fibres is a most characteristic feature of the tuberculous affection.

The discovery of the tubercle bacillus in the urine of course places the nature of the affection beyond doubt. Nevertheless, the detection of the bacillus in the urine is not an easy matter, and it may be absent in undoubtedly tubercular cases, so that too much stress must not be laid upon this method of diagnosis. The bladder symptoms will sometimes create a suspicion of vesical calculus, especially in the early stages, and the surgeon may have to be called in to assist in the diagnosis by the aid of the sound. Affection of the lower urinary tract or of

the genital organs, will, if present, differentiate tubercular from calculous pyelitis. Also, in both calculous and cancerous pyelitis there is usually more hæmaturia than is present in the tubercular form. The hectic fever and wasting of tuberculosis and especially the signs of tuberculosis elsewhere in the body, afford most valuable aid in making the diagnosis.

Prognosis.—Miliary tuberculosis of the kidney is always part of a general fatal process. The prognosis of chronic tuberculosis of the kidney is exceedingly grave. Nevertheless evidence of a healing process has been occasionally found in the kidney after death. If one kidney only be affected and the other organs of the body be healthy, it would seem possible that the affected organ might become shut off from the urinary passages and the tubercle become obsolete. This condition is indeed sometimes found after death from other diseases, although unsuspected during life. When both kidneys are affected, or other organs are seriously diseased, only a fatal prognosis can be given. The duration of the disease is from a few months to three years, rarely longer.

Pathology.—Miliary tuberculosis of the kidney is always part of a general outbreak of acute tuberculosis, secondary in many cases to a caseous focus elsewhere in the body. Both organs are the seat of nodules, not usually very numerous, of varying size, the largest being about equal to that of a pin's head. The smallest nodules are grey in colour and almost transparent, the larger ones are more opaque, and may present a small yellow spot of caseation in the centre. Round each a zone of congestion may usually be seen.

The nodules are most numerous in the cortical portion near the surface of the organ, in the medullary portion but few are to be found. Their position is determined by the distribution of the arterioles with which they have an intimate relationship.

On *microscopic examination*, the nodules are seen to consist of the ordinary elements of tubercle, giant cells, epithelioid cells, and some smaller round cells. The larger nodules are often composed of amalgamated individual tubercles. The interstitial tissue is the favourite seat of the tubercles, but they may also be found in the interior of the urinary tubes and also in the glomeruli.

Tubercle bacilli are found in large numbers in the nodules and have been

described as filling the small blood-vessels.

Secondary changes are also seen. The epithelium of the convoluted tubes throughout the kidney may show degenerative changes and even necrosis. The centre of the nodules is often necrosed and caseous, and the glomeruli and surrounding tissue sometimes share the same fate. Necrosis is occasionally more massive. Small anæmic infarcts of thrombotic or possibly embolic origin, are not infrequently observed. Miliary tubercles of the kidney are more common in children than in adults.

Caseating tubercle may be primary in the kidney, and although it is frequently accompanied by tuberculous lesions in other parts of the body, these are, as a rule, less advanced in development than the kidney affection. In its earlier stages the lesion has the form of grey or yellow nodules in the substance of one or more of the medullary pyramids. The nodules enlarge, coalesce, caseate, soften in the centre, and spreading at the periphery, make their way into the pelvis of the kidney, and also towards the cortex.

In this way irregular cavities are formed, filled with caseous, putty-like material and communicating freely with the urinary passages. In addition to the extension from the periphery of a nodule, fresh nodules form in the cortex by infection, through the medium of the lymphatics and blood-vessels. Moreover, there is reason to believe that the tuberculous process may be continued in the epithelium of the urinary tubules and thus also proceed towards the cortex. By extension of the tubercle in these ways the whole of the kidney substance may successively be attacked and destroyed.

Associated with this lesion, there are often found tuberculous lesions of the ureters and bladder, and, in the male, of the testes and vesiculæ seminales. These may be secondary to the kidney tubercle, infection being carried down by the discharge of tuberculous material into the urine. But in some cases the tuberculosis of the genital organs or of the bladder appears to be primary, and to be communicated to the kidney by means of the lymphatics.

Tuberculous pyelitis shows itself by the presence of tuberculous matter in the sub-mucous layer of the pelvis of the kidney. The mucous membrane becomes inflamed, the tuberculous mass caseates, softens and by ulceration makes its way through the mucous membrane to the

general cavity of the pelvis. The walls of the pelvis are then converted into ulcerated, pus-discharging surfaces.

The ureter also is similarly affected, and is changed into a rigid tube, the lumen of which may be much narrowed or even obliterated, either by tubercle in its walls, or by thick caseous material conveyed into it from above.

The blocking of the ureter leads to distension of the pelvis of the kidney by the accumulation of inflammatory and degenerated products, and to the formation of a pyonephrosis. While the tuberculous pyelitis may be the continuation of a caseating tubercle of the kidney, it may itself lead to destruction of the kidney-substance, partly by invasion of tubercle, partly by pressure of retained pus, and finally nothing may be left of the organ but a sac with thickened fibrous walls, filled with a yellow creamy or putty-like material containing fatty masses, cholesterol, tubercular débris and sometimes calcareous matter.

As will be seen from the above description, caseating tubercle of the kidney and tuberculous pyelitis, by the progress of each affection, lead in the end to the same condition which is sometimes termed the "Scrofulous" kidney. The microscope reveals the tuberculous nature of the change, and that not only the cellular elements of tubercle, but also the tubercle bacillus, are present in the diseased parts. In certain cases the process oversteps the bounds of the kidney and spreads to the neighbouring organs and tissues; the softened kidney may even burst into the peritoneum.

Ætiology.—This form of tuberculosis is a disease of adult life. It may be limited to one side, but frequently affects both kidneys, albeit more advanced in one than the other. It is more common in males than females.

Treatment.—The treatment can in nearly all cases be palliative only, and is the same as that of chronic pyelitis from other causes. (*See PYELITIS.*)

Opiates, the warm bath and anodyne applications may be prescribed for the relief of pain. Iron, arsenic and cod-liver oil serve to maintain the general strength.

Nephrotomy may be performed when there is considerable pus-accumulation in or around the kidney, and the abscess cavity may be drained and treated on ordinary surgical principles. Removal of a scrofulous kidney has been resorted to with the object of relieving the patient from a suppurating focus which would be

liable to cause exhaustion and albuminoid disease, or with a view to entirely eradicate the tuberculous disease, when it is confined to one kidney. The applicability of nephrectomy to this class of case is, however, as yet open to question. Before such an operation is performed it is desirable one should know that the opposite kidney is sound. From ordinary physical examination this cannot be certainly ascertained, but Dr. Newman has found it possible to determine the point by catheterization of the ureters and separate examination of the urine from each kidney. But if both kidneys be affected we have no means of estimating surely how much healthy and physiologically available renal structure will remain after removal of one greatly diseased organ. Valuable aid may, however, sometimes be obtained by determining the quantity of urea excreted daily. ROBERT MAGUIRE.

KIDNEY, TUMOURS OF.—The tumours of the kidney are malignant and benign.

MALIGNANT TUMOURS occur in the kidney as both primary and secondary formations. The secondary tumours are not usually large, are generally found in both kidneys, and are seldom of any clinical importance. Their situation in the kidney is irregular, and depends upon the spot in which the infecting matter finds rest.

Primary malignant tumours of the kidney may attain a great size. They attack, as a rule, one kidney only, neither side being especially preferred. The extremes of life, rather than the middle periods, seem to be most prone to their development. The tumour most commonly begins in the cortex of the kidney, but it may originally be situated beneath the capsule, or in the sub-mucous tissue of the pelvis of the organ. Its consistence is nearly always that of an encephaloid growth, and even though large it retains, to a great extent, the rough outline of the kidney. The tumour spreads according to the ordinary laws of such growths, along the course of the blood-vessels, or lymphatics, or by contiguity to the neighbouring parts. It very rarely infects the lower urinary passages.

Sarcoma.—This is the most common malignant tumour of the kidney. It may consist of small round cells, occasionally arranged in alveoli (alveolar sarcoma) or, less commonly, the cells are spindle-shaped. The sarcoma is often very vascular, and contains large hæmorrhages.

It soon makes its way into the pelvis of the kidney.

A remarkable variety of sarcoma found here in rare instances is that containing striped muscular fibres (rhabdo-myosarcoma). This, it is believed, develops from remnants of either the protovertebræ or the Wolffian body. Other varieties of sarcoma which are met with in the kidney are the adeno- and the myxosarcoma.

Melanotic tumours are sometimes found in the kidney secondary to similar growths elsewhere, and are usually of sarcomatous nature.

Carcinoma is much less common. It starts occasionally in the Malpighian corpuscles, or these may be imbedded in the cancerous stroma. Again, the cancerous tissue may be a mere intrusion into the kidney substance, causing atrophy of the proper renal elements, or it may apparently be a conversion of the kidney tissue into malignant growth. Carcinoma rarely communicates with the pelvis. It may be present in the forms of encephaloid, scirrhus or colloid carcinoma or of epithelioma.

Adenoma of the kidney is never large enough to become of clinical importance. It is a tumour nearly allied to carcinoma, and consists of glandular structure, varying in its characters according to the portion of the kidney in which it may arise. Thus it may exhibit the features of either the convoluted or straight tubes. Lymphadenoma also may attack the kidney when it is present in other parts.

BENIGN TUMOURS but rarely attain a sufficient size to be of clinical importance. It will be unnecessary to do more than enumerate them. There are here found fibroma, angioma, lipoma, myxoma, enchondroma, osteoma, and villous papillomata, which, however, are often sarcomatous. Further, in leucocythæmia small growths are sometimes found in the kidneys, consisting of accumulations of leucocytes. Lastly, Grawitz and others have described curious small tumours in the kidneys, which have the structure of the adrenal bodies, and are probably instances of aberrant growth.

Symptoms and Signs.—An enlargement of the kidney, whatever its cause or nature, has the following characters. It is situated in the lumbar region of the abdomen, its centre opposite to, or slightly above, the level of the umbilicus. It projects towards the front of the body, rarely towards the back. It is usually immovable during respiration. Nevertheless, not infrequently, a great enlarge-

ment will move downwards to an appreciable extent in inspiration, retiring in expiration; moreover, the examiner's hands, placed one in front and one behind the enlargement, can often move the growth over a considerable area. The mass is rounded at all parts; sometimes, according to its nature, presenting rounded knobs on its surface. The hand can detect an interval between the kidney enlargement and the liver or spleen above, the pelvis below. On percussion the tumour itself is dull, but, since it lies behind the large intestine, the dulness is crossed from above downwards by a more or less vertical band of resonance produced by the gas-distended colon, and may sometimes be entirely covered by intestinal resonance. (*See ABDOMINAL TUMOURS, DIAGNOSIS OF.*)

There may or may not be changes in the urine, such as the presence of albumen, blood or pus, for a tumour of the kidney may not open into the urinary passages; and, further, the urinary passages of the diseased side may be blocked, and healthy urine from the sound kidney alone reach the bladder.

The enlargement presses on surrounding parts, and thus may cause oedema of the legs, varicocele and superficial venous distension from pressure on the veins, constipation or diarrhœa, from pressure upon, and irritation of, the bowel, and vomiting and nausea, from disturbance of the stomach. Such are the usual symptoms and signs of renal enlargement, but, as might be expected, they are subject to occasional variations.

The tumour may be so large as to entirely fill the abdomen. The intestines may be pushed quite to one side. The growth may affect one portion only of the kidney, and thus appear in an unusual situation. Also, enlargement may occur of a kidney abnormally placed.

The special character of hydro- and pyo-nephrosis, and other cystic tumours of the kidney, are described under their appropriate headings.

Practically, the solid tumours of the kidney which come to be of clinical importance are all malignant in nature. Such tumours are characterized by the following special signs in addition to those enumerated above.

Hæmaturia is a frequent symptom, but, for the reasons given above, its presence must not be relied upon. If present it is usually intermittent and profuse. Albuminuria may also occur. The cells of a malignant growth may reach the urine, but they cannot with certainty be dis-

tinguished from the various epithelial cells which may also be present. Pain is experienced, and is sometimes very severe, occasionally shooting down in the direction of the ureter, often it is intermittent. The tumour itself may, however, be not even tender.

In most cases the general health rapidly suffers, but it is sometimes for a long period but slightly affected.

The tumours of clinical importance are generally primary, and therefore are limited to one side only. It must be mentioned that a malignant growth is sometimes so soft, and its consistence may be so much obscured by the interposition of intestine, that a sense of fluctuation is imparted, and the tumour may erroneously be diagnosed as of cystic nature.

Diagnosis.—Uncertainty in the diagnosis of tumours of the kidney will specially arise in connection with tumours of the liver, spleen and ovary, and accumulations of fæces in the colon.

When changes in the urine are present, little difficulty will, as a rule, be experienced; albeit, it must be remembered that hæmaturia need not necessarily be dependent upon a co-existing tumour in the abdomen.

In the absence of this indication, a tumour of the right kidney will be distinguished from one of the liver, by the possibility of passing the hand between the tumour and the liver, and possibly of feeling the edge of the liver, while often a line of resonance can be demonstrated between the tumour and the liver dulness. When the renal tumour is large, such separation from the liver is not to be made, but the position of the intestine in front of the tumour is a very safe indication of its renal origin, while, on the other hand, the presence of jaundice would strongly point to the liver as its seat.

The edge of a splenic tumour is sharp, not rounded, and is often notched. Its dulness is not so absolute as that of a renal tumour, since the resonance of underlying colon may be conveyed through its thin substance. The dulness is not crossed by the colon, it extends upwards under the ribs towards the axilla, and downwards and inwards towards the umbilicus, in both these respects differing from a kidney tumour.

The collateral evidence — leucocythæmia, and a history of malaria in the splenic, hæmaturia in the renal affection — will assist the diagnosis. Further, in cases of splenic tumour, a resonant area can usually be detected between the

growth and the spinal column behind, this being absent in the case of a renal tumour.

An ovarian tumour is first evident below, can be detected in the pelvis, and its growth is upwards; a renal tumour grows from above and descends. Moreover, an ovarian tumour very rarely has intestine in front of it, but causes resonance in the flanks, where dulness would be most marked in the case of a renal tumour.

Fæcal accumulation produces a doughy, often elongated mass, which is removed by copious enemata. One such enema does not always suffice to remove the fæces, and in doubtful cases diagnosis should be suspended for a while. (*See also ABDOMINAL TUMOURS, DIAGNOSIS OF.*)

Prognosis.—The prognosis of malignant growths is always unfavourable. They cause death from exhaustion, and occasionally from rupture of the growth or a sudden hæmorrhage into its interior. The duration of life is shorter in children than in adults. Life has been occasionally most unexpectedly prolonged, in one case to seven years, and the disease sometimes passes through lengthy periods of quiescence.

Treatment.—In the early stages of the disease an attempt may be made to re-

move the diseased kidney, but so far this operation has not been attended with great success. All other treatment must be palliative. Pain may be relieved by opium and warm local applications. Hæmaturia, if excessive, should be treated by gallic acid, ergot or acetate of lead internally, or by the application of ice to the growth itself. Coagulation of blood in the urinary passages often produces intense suffering from impaction of the clots in the urethra; such clots should be pushed back into the bladder by a catheter, and afterwards broken down and washed away by injections of warm water.

ROBERT MAGUIRE.

KIESTEIN is the iridescent pellicle which sometimes forms on the surface of the urine after it has been allowed to stand for twenty-four hours or more; after a further lapse of time it falls to the bottom of the glass as a thick white flocculent precipitate. It consists chiefly of mucus, fat and crystals of triple phosphate. It derives its name from its supposed dependence upon pregnancy, in the later stages of which it is commonly present; but it is not a necessary accompaniment of pregnancy, and has been met with apart from that condition, and even in the urine of men.

L

LABIA, DISEASES OF THE.—

The labia may be the seat of **chancres**, which are often accompanied by much œdematous swelling. The swelling often remains after the chancres have healed; and the presence of persistent œdema of one labium should arouse a suspicion that there may have been a chancre.

Erysipelas may attack the labia like any other part of the body.

An **inflammation** of the labia is sometimes seen resembling erysipelas in the extensive swelling and redness that it produces, but differing in that it does not spread. This affection, in favourable cases, lasts a few days and then subsides, but it may be so severe as to produce sloughing. This is seen after acute fevers, such as typhus and small-pox, and after delivery. The inflammation may follow a wound, the swelling being great because of the abundance of loose cellular tissue in the part, but sometimes it occurs without a history of violence, or the discovery of a wound and without pregnancy or

previous illness. It is usually bilateral; a fact against its being simply the result of traumatism.

Treatment.—Inflammation of the labia should be treated by rest, and the application of an evaporating lotion (liq. plumbi acet. 3ss, spt. vin. rect. 3ss, aq. Oj). If the part become gangrenous, and the gangrene shew any tendency to spread, the slough should be separated, and the part freely canterized and then kept clean by frequent washing with an antiseptic lotion.

Abscess—usually of one labium only—may occur. It is generally in Bartholin's gland, and is often due to gonorrhœa, but may be the result of injury. It is easily identified, presenting itself as a tender, fluctuating, non-reducible swelling of the labium. If left alone, an abscess of Bartholin's gland will burst, discharge, close and refill; and this sequence of events will be repeated indefinitely until effectual treatment is adopted.

The *treatment* is to dissect out the

gland. If the surgeon be able to carefully dress the wound himself, it will be enough to cut a large piece out of the wall of the gland; but even when this is done, unless the aperture be kept open by careful dressing, it may close and the abscess refill.

Epithelioma is seen on the labium as a warty growth, accompanied by destructive ulceration, which shows no sign of healing.

The *treatment* is to remove the growth and a good margin of healthy tissue with the platinum knife of Paquelin's cautery. If the growth be advanced, the inguinal glands on the corresponding side will be affected. If these, although enlarged, are yet movable, they should be removed at the same time as the growth.

Innocent growths, as lipomata and molluscum fibrosum, are met with in the labia. The labia may also be enlarged by elephantiasis.

Growths of this kind can only be treated by removal, and this is indicated if their bulk be enough to cause inconvenience.

The labia also may be the seat of various skin affections.

Herpes, when present, runs its usual course, and only requires dry and sedative applications—*e.g.*, powdering with bismuth, or the application of ung. plumbi subacet. co., or, if pain be severe, of bismuth. oxychlor. gr. xxx, morph. hyd. gr. x, vaselin ʒj.

Eczema is often seen on the labia, especially in elderly, plethoric, gouty women, or in the subjects of diabetes. It is best treated by purgation with antacid remedies (mag. sulph. ʒj, mag. carb. gr. x, spt. am. arom. ℥xx, aq. ʒj, t.d.), rest, the avoidance of alcohol, and a restricted diet. For local application either ung. plumbi subacet. co. or ung. zinci, or ung. hyd. nit. and ung. zinci, p. æq., may be used, the first being preferred if the parts be very sore, the last if the condition seem a chronic and indolent one.

Warts are often seen on the labia, as well as on the skin around. The non-syphilitic warts are acuminate, not flat and overhanging. They are associated with uncleanliness and unchastity; they are proof of the former, but not of the latter.

Treatment.—If small, they should be kept dry by the use of a powder of calomel and oxide of zinc. If large, they may be cut off with scissors, hæmorrhage being arrested by pressure and perchloride of iron, or with Paquelin's cautery.

Condylomata, Mucous Tubercles, Syphilitic Warts (secondary) are moist,

flat, broad, overhanging white patches. They may become ulcerated.

Treatment.—Black wash should be applied locally, and mercury given internally.

The labia may also be the seat of so-called "*lupus*" (*q.v.*). A labium may be swollen by a thrombus or hæmatoma (*q.v.*). *Boils* occur sometimes on the labia. They are distressing by the pain they produce, and the suspicions that they sometimes suggest; but they are not otherwise important, and require no treatment special to this part.

Hydrocele of the Labium is a tumour formed by patency of the canal of Nuck, so that the labium contains a process of peritoneum filled with fluid. If the canal be largely open a piece of bowel or omentum may come down; if small, the sac only contains fluid. The channel of communication may become closed, so that the fluid cannot be pressed back into the abdomen. It requires to be carefully diagnosed from a hernia. It is usually recommended to treat it like a hydrocele in the male, by injection of iodine. But bearing in mind the possibility of erroneous diagnosis, and also of the peritoneal communication being not quite closed, probably the safer practice is to cut down upon, open, and remove the sac.

G. E. HERMAN.

LACTATION.—The functional activity of the mammary glands.

These glands begin to become more vascular, to grow, and to secrete, early in pregnancy (*q.v.*). In the two or three days after delivery their development rapidly increases, and the secretion of milk becomes abundant. The older authors (in pre-thermometric times) supposed that the development of mammary activity was accompanied with fever, which they called "milk fever." But accurate observation of the temperature has shown that the secretion of milk is not attended with fever.

It is common for the breasts to be painful and tender during the fulness which precedes the complete establishment of the secretion, but this pain and tenderness pass off when the flow becomes abundant.

The milk first secreted is called *colostrum*. It is less homogeneous than that produced afterwards, looking like a serous fluid with yellow streaks and spots. On microscopical examination, it is seen to contain "colostrum corpuscles," which are the epithelial cells of the mammary glands full of oil globules. After about the third day these cells burst and set

free the fat globules before they leave the gland, and thus the true milk, a bluish-white, homogeneous fluid, is formed. It is generally believed that the colostrum has a slight purgative effect on the child, but, according to Depaul, the same purgation results if the child be put at once to the breast of a wet-nurse who has ceased to produce colostrum.

Milk contains about 11 per cent. of solid matter. This consists, roughly, of butter $2\frac{1}{2}$ per cent., casein 4 per cent., sugar $4\frac{1}{2}$ per cent., and besides this there is about 0.15 per cent. of salts. The amount of milk secreted daily when lactation is fully established is about 3 pints. During lactation menstruation is commonly suspended, but it is, nevertheless, possible for conception to occur at this time. The secretion of milk spontaneously ceases if the breasts are not regularly emptied by sucking. The usual duration of lactation in this country is about nine months. But in weakly women the secretion frequently ceases spontaneously before this time; and in strong women it will continue almost as long as the stimulus of sucking is applied. In uncivilized countries it is not uncommon for women to suckle children for years. By sucking it is possible to make the breasts of virgins or old women, or even the male breast, secrete milk.

After spurious labour in extra-uterine gestation (*q.v.*) the secretion of milk begins just as after a normal delivery.

There is no drug that has any specific effect either in promoting or checking the secretion of milk. The former purpose is best attained by a diet liberal in quantity and containing plenty of meat and milk; the latter, by a restricted diet, combined with saline purgation. Belladonna and iodide of potassium are often given for the purpose of checking the mammary secretion, but no scientific evidence has been produced that either drug has any effect of the kind, and the action of each is admitted by all to be very uncertain.

Hindrance to lactation may arise on the part of the mother from general debility, so that the breasts soon cease to produce milk. Or the milk may be poor in quality, so that the child does not thrive. It is not possible to estimate the nutritive power or digestibility of a mother's milk by any kind of chemical analysis. The effect on the child is the only test of the suitability of the milk for it.

Lactation may also be hindered by

disease of the nipple, which may be small, flat or sunken. By pulling out the nipple with the fingers (by which erection of the nipple is provoked) it may usually be made prominent enough for a healthy child to seize. In the worst cases its prominence may be increased by Kehrer's operation. Soreness of the nipple may hinder suckling. This usually comes on in the first few days, and, if properly treated, gets well within the first fortnight. It usually commences with the formation of small vesicles at the apex of the nipple. These quickly break and dry into brown crusts, underneath which, when detached by sucking, excoriations are found. There are also sometimes deep fissures running transversely round the nipple. These are rarer, they are more painful, and take longer to heal.

The treatment is to apply glycerin of borax to the sore nipple, to protect it during suckling by a nipple shield, and to carefully dry it after suckling. To prevent sore nipples, it is well to wash the nipple night and morning during the last few weeks of pregnancy with equal parts of brandy or whisky and water, and to carefully dry it after suckling.

In the case of premature children suckling may be impossible, because the child lacks strength to seize the nipple. In that case it is best to draw off the milk by a pump, and give it to the child with a spoon.

G. E. HERMAN.

LARYNGISMUS STRIDULUS
(*Spasmodic Croup; Spasm of the Glottis*).—A spasmodic affection of the larynx.

Symptoms.—The essential feature of the disorder is a liability to sudden attacks of complete arrest of breathing, lasting a few seconds, and followed by a crowing inspiration. The affection is almost peculiar to the first two or three years of life. Attacks are said to be most liable to come on as the child awakes from sleep; perhaps, more correctly, the attack awakens him, and although supposed always to take place at night, they are in reality almost, if not quite, as common in the daytime. The child may be playing, apparently in his usual health, when he suddenly stops, perhaps makes a little noise in the throat, and struggles for breath, the head is thrown back, the mouth is open, the hands are clenched, and the chest fixed. In this state the patient remains a few seconds, according to the severity of the attack. The face meanwhile becomes livid and then of an ashy hue, whilst the lips and tongue become

more or less black. The spasm terminates as suddenly as it commences, with one or more long, loud, crowing inspirations, and the child may at once resume his play or be fretful or sleepy. There is no loss of consciousness.

The length of the attacks and the frequency of their recurrence depend upon the severity of the case; sometimes the child will have one every few minutes, both night and day, at others a single nocturnal attack will constitute the whole malady. In the mildest form the spasm is not complete, one or more laboured inspirations with crowing being all that is observed. On the other hand, the attack may be so severe that the child dies suffocated. A fatal result would, doubtless, be more common were it not that, just as in asthma, the state of asphyxia, when advanced, causes a relaxation of the spasm, and thus allows the glottis to be re-opened. The attack may terminate in a general convulsion, but this is rare. Laryngismus is a constant accompaniment of tetany (*q.v.*), and is also closely associated with "facial irritability," a condition in which contraction of the facial muscles is obtained when the finger is lightly brushed over the cheek, where the facial nerve spreads out just above the zygoma.

Pathology.—Spasm of the adductors of the larynx is the actual condition during the attack, and this is probably of central origin; but whether primary, and therefore a species of epilepsy, or secondary, and consequent on reflex irritation, is still a matter of dispute. It is to be presumed that some affection of the respiratory centre in the medulla is the cause of the spasm, but the exact nature of the change is unknown. It has been justly observed that an attack presents many of the phenomena of an epileptic seizure, but it is noteworthy that if this really be a manifestation of epilepsy it differs from all other forms of that disorder in that the liability to the attacks invariably passes off as age advances. In fatal cases, the post-mortem appearances are those of death from asphyxia (*q.v.*).

Ætiology.—Laryngismus is said to be more common in male children. It is seldom seen before the age of six months or after three years. It is much more common during the winter months. The subjects of the affection are always rachitic in some degree, and are often neurotic, there being also a history of neurotic tendencies in the parents. It is impossible in many cases to determine the exciting cause of an attack, but this

is usually to be found in some error of diet or digestive disturbance, or outburst of passion; indeed, the mothers sometimes describe the seizures as "passion fits." The existence of facial irritability betrays an unusual degree of excitability to stimulation on the part of the seventh nerve, and it is a justifiable assumption that a similar condition of the laryngeal nerves exists.

Treatment.—At the moment of an attack there is not much to be done except to see that the clothes are not too tight around the child's chest. An attempt may be made to relieve the spasm by pushing up the chin, as this would tend to raise the larynx, and possibly to open it; but as a rule the attack is over before much can be attempted. When asphyxia is threatened, tracheotomy may be resorted to, followed by artificial respiration, and the other measures proper to restore suspended animation.

General treatment is all-important; the child should be taken out every day unless the weather be exceptionally bad. The sleeping and day rooms should be thoroughly ventilated, the window being left open for an hour or two at a time; he should be warmly clothed, but the clothes should not be too tight; every night and morning he should have a tepid bath, and the front of the neck should at the same time be sponged with cold water. The diet should be regulated, and any digestive disturbances corrected by appropriate treatment. If the child be rickety, cod-liver oil should be given with steel wine. If the treatment be carried out on these lines the liability to the attacks will certainly diminish.

JOHN ABERCROMBIE.

LARYNGITIS, ACUTE.—Acute inflammation of the mucous membrane of the larynx.

Symptoms.—When this disease occurs in the adult, the first symptom complained of is, usually, a sense of discomfort and irritation referred to the larynx, accompanied by a dry, tickling cough, and hoarseness or loss of voice. There is pain on pressure over the larynx and some discomfort in swallowing, and in severe cases dyspnoea is present.

These symptoms are sometimes preceded by those of an ordinary nasal or pharyngeal catarrh, and are ushered in by chilliness and rise of temperature; the pulse is frequent and full, and the face flushed. If the disease advance unchecked, especially if serous infiltration

(œdematous laryngitis) occur early, the countenance becomes anxious, or pale—or somewhat livid; the pulse feeble and irregular, and the usual signs of carbonic acid poisoning show themselves. The amount of obstruction to the entrance of air is indicated by the noisy, stridulous breathing and marked respiratory excursions of the larynx, and the great activity of the muscles of respiration.

In children, owing partly to their tendency to laryngeal spasm, and partly to the narrowness of the glottis, dyspnoea is usually present, and comes on in paroxysms, so that a child who goes to bed with only slight catarrhal symptoms and a little hoarseness, may awake in the night with a start, in great terror and distress, from difficulty of breathing, a condition constituting one variety of the *croup* of the old authors.

On making a laryngoscopic examination, the mucous membrane of the larynx, especially that covering the ary-epiglottic folds, is found to be swollen, forming, in some cases, pyriform swellings, sometimes reducing the rima glottidis to a mere chink; the epiglottis in such cases is found to be swollen and erect. The vocal cords are also swollen and much congested, and usually their mobility is impaired, either from inflammatory infiltration of the muscles acting upon them, or from swelling of the soft parts. If the inflammation goes on to suppuration, a more or less localized tumour may be detected, and the colouring of the pus, which has formed, may even be recognized through the mucous membrane.

Diagnosis.—In the adult the diagnosis of acute laryngitis is easily made, but in the child there may be considerable difficulty, as just in those cases in which a laryngoscopic examination is most required is there the greatest difficulty in making one with any degree of success.

Acute catarrhal laryngitis in the child has to be differentiated from spasmodic croup or laryngismus stridulus and from laryngeal diphtheria. From the former it is to be distinguished by the presence of fever and hoarseness, and by its onset being usually ushered in with coryza, and by the absence of carpo-pedal contractions. The diagnosis from laryngeal diphtheria is more difficult, but in that affection there is generally some membranous deposit to be seen on the pharynx, there is swelling of the lymphatic glands beneath the angle of the jaw, and albuminuria; the symptoms are of a more asthenic type, and the disease usually occurs in epidemics. It is well, however,

not to be too eager to give a definite opinion at the commencement of a case.

Prognosis.—Simple catarrhal laryngitis almost invariably runs a favourable course in the adult, and even in the child, though the symptoms are more urgent, recovery takes place in a very large proportion of the cases. In œdematous laryngitis, on the other hand, the prognosis is extremely unfavourable, especially in the form associated with erysipelas. The observation of Hippocrates that if the erysipelas proceed from within outwards recovery usually follows, whilst if the disease extend from the surface internally, death is the result, has been confirmed by modern experience.

Pathology.—Acute laryngitis differs in its pathology in no respect from inflammation occurring in other mucous membranes.

Ætiology.—The mild form of acute laryngitis usually comes on from catching cold, or it may result from the overuse of the voice. More severe forms may be met with in connection with the exanthemata, especially measles, or they may result from the spread of inflammation from neighbouring parts, such as the pharynx. Œdematous laryngitis has been met with in Bright's disease, but Dr. George Johnson denies its frequent connection with this disease. Traumatic laryngitis, as its name implies, depends on injuries to the larynx, such as may occur from scalds, from corrosive poisons, or from the impaction of foreign bodies.

Treatment.—The most important factor in the treatment of acute laryngitis is the attainment of functional rest. In endeavouring to fulfil this indication, the twofold functions of the larynx (*i.e.*, phonatory and respiratory) must be borne in mind. Any reasonable patient will readily understand the necessity of abstaining from talking, so that one function of the larynx can be held more or less in abeyance. Only very partial rest can be obtained for the other function, but this is to be sought for by keeping the patient as quiet as possible; in severe cases he should be confined to bed, so as to diminish the frequency of the respirations. The temperature of the room should be about 65° F. and the air moistened by means of steam from a bronchitis kettle, and the addition of a teaspoonful of the compound tincture of benzoin to the water in the kettle has a sedative effect; or an inhaler may be used with the same quantity of the tincture in a pint of water.

The diet should be of an unstimulating nature and semi-solid, so as not to cause trouble in swallowing—bread and milk, rice, sago, tapioca, beef-tea and mutton broth are the best. If the bowels be confined, a saline aperient is indicated. A diaphoretic, such as half an ounce of solution of acetate of ammonium, with twenty minims of the spirit of nitrous ether, made up to an ounce with camphor water, may be given every four hours. If the patient be very feverish, twenty minims of antimonial wine, or four or five of tincture of aconite may be added to the mixture. If cough be a troublesome symptom, the addition of half a drachm of the compound tincture of camphor and the same amount of the oxymel of squills will generally give relief. Should signs of œdema of the larynx manifest themselves, the patient should have ice to suck, and an ice-bag collar should be placed round the neck; if, in spite of these precautions, improvement does not set in, the œdematous tissue should be scarified. This procedure is facilitated by previously spraying the larynx and pharynx with a 10 per cent. solution of the hydrochlorate of cocaine. If scarification fail to relieve the patient, or only does so temporarily, tracheotomy should be performed without delay.

F. DE HAVILLAND HALL.

LARYNGITIS, CHRONIC.—Chronic inflammation of the mucous membrane of the larynx.

Symptoms.—The symptoms complained of are all referable to the larynx, the patient experiences a sense of uneasiness and tickling there, which causes a frequent desire to clear the throat; the expectoration is usually scanty, consisting chiefly of small pellets of mucus. The voice is always more or less affected, varying from slight degrees of hoarseness up to complete aphonia. The hoarseness is generally worse when the voice is first used, especially in the morning; after a little use it regains some amount of power, but fatigue is soon felt if talking be continued for any time.

On making a laryngoscopic examination, the cords will be found to have lost their normal whiteness and to vary in colour from a pale pink to a bright red, but the colour is never so intense as in acute laryngitis. Sometimes only one cord is affected, indeed the congestion may be confined to a portion of one cord. Viscid mucus will usually be found adhering to the laryngeal membrane, especially in the arytenoid commissure, and on phonation

the cords may stick together momentarily. Accompanying the congestion there is occasionally loss of mobility in the cords, or defective tension, so that on phonation the cords do not come into apposition, but leave an oval gap between them.

Diagnosis.—As laryngeal tuberculosis in the early stages usually presents the appearances of a chronic laryngeal catarrh, it is important that in cases of any standing the lungs should be carefully examined and the sputa submitted to microscopic examination for bacilli. The diagnosis from malignant disease is at times very difficult, but the occurrence of thickening and congestion of one cord, with defective mobility of the same, in persons over forty, should give rise to serious suspicion that a growth may be present.

Pathology.—The changes ordinarily met with in chronic inflammation of mucous membranes are found in chronic laryngitis.

Etiology.—The causes of chronic laryngitis are practically the same as those producing the acute form of the disease; indeed, chronic laryngitis is very commonly preceded by an acute attack. Over-use of the voice, excessive smoking and drinking, are predisposing conditions. Impeded nasal respiration has only recently attracted attention as a cause of chronic laryngitis, yet in the writer's opinion it is a very potent one. Atrophic rhinitis, which is so frequently accompanied by a dry and glistening condition of the pharynx (pharyngitis sicca), also leads to chronic catarrh of the larynx. Persons whose occupations expose them to the inhalation of irritant particles, to sudden change of temperature, or who are called upon to use their voices in the open air, are especially liable to chronic laryngitis.

Treatment.—The only treatment of any avail in the more obstinate forms of chronic laryngitis is the direct application of astringent remedies to the larynx by means of the brush. A solution of chloride of zinc 15 to 30 grains in an ounce of water, with the addition of 20 minims of dilute hydrochloric acid, which renders the salt more soluble, is the best; this should be applied daily. In the event of spasm being excited by the application, the patient should be told to hold his breath and then to breathe through the nose; if this is not sufficient, sipping a little cold water will usually have the desired effect. If the chloride of zinc fail to cause improvement, a stronger astringent must be tried; for this purpose there is nothing better than a solution of nitrate of silver. It is customary to begin with

a solution of 10 grains to the ounce, and to gradually increase the strength, if necessary, up to 90 grains to the ounce. The writer has used nitrate of silver solution with some degree of caution since he saw a case of argyria resulting from the application, extending over some weeks, of a solution of nitrate of silver to the pharynx. In cases in which it is not possible to use the brush an astringent spray may be tried—the hand-ball spray apparatus being employed to generate the spray. The following solution is one of the best:—R Zinci chlor. gr. xij, acid. hydrochlor. dil. ℥xv, tinct. limonum ℥iij, aquam ad ℥vj; ft. sol. Or 3 grains of tannic acid in an ounce of water, or 1 to 3 grains of the perchloride of iron to the ounce of water may be used. Inhalations of creasote, or of the oil of the Scotch fir, are sometimes found of use. Attention should be directed to any of the causal conditions, such as excessive smoking or drinking, the over-use of the voice, or constipation.

If, after the removal of congestion, the voice remain feeble, the use of electricity, either in the form of the continuous or of the interrupted current, is to be recommended. In some cases of long-standing laryngitis benefit has resulted from a course at Ems or Aix-les-Bains.

As regards general treatment, the patient's health must be improved as much as possible; coddling undoubtedly increases the tendency to laryngeal catarrh, so that the neck should not be wrapped up; at the same time allowing the beard to grow has often a very beneficial result. Sponging the chest and neck with cold water in cases where a cold bath is not taken, is of great service; regular exercise should be enjoined, and hot and crowded rooms avoided.

When the laryngeal secretion is scanty and viscid the chloride of ammonium inhaler is of use, and compressed tablets of chloride of ammonium with borax or chlorate of potassium may be advantageously sucked in the intervals.

The necessity for free nasal respiration should not be overlooked, as many cases of chronic laryngitis result from obstruction to the nose by polypi, or other morbid conditions; as a consequence air enters the larynx without having been previously warmed and moistened by passing through the nostrils.

F. DE HAVILLAND HALL.

LARYNGOSCOPE.—This instrument is now so well known that a detailed description of it is unnecessary.

Some physicians prefer the reflecting mirror fixed to a band which encircles the head, others have a preference for the form in which the reflector is fixed in a spectacle frame; the latter is perhaps the most convenient.

The lime-light is the best means of illuminating the interior of the larynx; Mackenzie's rack-movement lamp is a very convenient arrangement, but a duplex lamp with crystal oil will answer all ordinary requirements. The electric light has not yet come into general use for laryngoscopic purposes.

In making a laryngoscopic examination, the patient is seated opposite the physician: the light is on the right side of the patient, level with his ear; and the reflector is adjusted so as to throw a cone of light directly upon the pharynx. The under surface of the laryngeal mirror is heated to prevent moisture condensing on it, and its temperature should be tested with the hand before introducing it into the patient's mouth. The patient should be directed to breathe quietly during the examination, and to say *eh*, *ah*, or *e* when told. The physician then grasps the patient's tongue, which should be enveloped in a handkerchief or piece of linen, with his left hand, the thumb being above. The mirror should now be introduced and passed to the back of the mouth, so that it presses backwards and upwards against the uvula, care being taken not to touch the surface of the tongue. The patient may now be told to vocalize. Thanks to the introduction of cocaine, it is possible to examine with ease patients who have very irritable fauces, as, after painting a 10 per cent. solution of this drug on the soft palate and adjacent parts, the sensibility of the mucous membrane is, in about two minutes, almost entirely lost.

It must be borne in mind that the image which is seen on the laryngeal mirror is inverted, so that the anterior part of the larynx is seen at the posterior part of the mirror, but that there is no lateral change—that is to say, the vocal cord which is seen on the *patient's* right is the right cord.

It is desirable that a laryngoscopic examination should be made methodically. The first glance should be directed to the colour of the mucous membrane, as the mere presence of the mirror sometimes sets up congestion. Having satisfied one's self as to the colour, attention should now be paid to the motility of the cords, and, finally, note should be taken

of the presence of new growths, ulcers, or other morbid appearances.

F. DE HAVILLAND HALL.

LARYNX, LUPUS OF.—This, although a somewhat rare disease, would be discovered more frequently if the larynx were examined in all cases of lupus of the face. The result of systematic examination goes to prove that the larynx is affected in about 6 or 7 per cent. of the cases.

Symptoms.—Inasmuch as lupus of the larynx is not in its early stage a painful affection, it may be overlooked unless a laryngoscopic examination be made. Usually, however, there is hoarseness, sometimes going on to complete aphonia, and, when the soft parts become infiltrated, dyspnoea may supervene. If the epiglottis be destroyed, the patient frequently has difficulty in deglutition, cough being excited by the entrance of food into the larynx. On examination, in some cases, the mucous membrane of the pharynx and epiglottis has been found extremely pale. The epiglottis is usually irregularly enlarged, and shows, not infrequently, a considerable loss of substance. The general appearance of the interior of the larynx is rough, thick, and granular, and has a worm-eaten appearance.

The *diagnosis* of primary lupus of the larynx is very difficult, some laryngologists go so far as to say that one can never be sure of lupus of the larynx unless one find lupus elsewhere. It requires to be distinguished from epithelioma, syphilis, and phthisis of the larynx, but in this there is usually no great difficulty except as regards the latter affection. The greater age of patients with epithelioma, the more unequal surface and harder character of the growth, and the fact that it is commonly unilateral at the commencement, will aid in the diagnosis. Syphilitic affections of the larynx generally run a more rapid course, partake more of the nature of loss of substance than of new formation, and are usually speedily benefited by iodide of potassium. The slow progress of the case, the absence of pain, and the little effect it has on the general nutrition will alike serve to differentiate lupus from syphilis and phthisis of the larynx.

Prognosis.—Apart from the risk of suffocation, either from acute oedema, which is exceedingly rare, or from gradual infiltration of the soft parts, lupus of the larynx is not of immediate danger to life, since it increases slowly, and may

remain stationary for years, but, though not a very fatal disease, its complete and permanent cure is a matter of extreme rarity.

The *pathology* and *etiology* of this disease are the same as for lupus of the skin. The larynx may be affected primarily, but usually the affection is secondary to lupus of the face, nose or mouth.

Treatment.—For constitutional treatment, reference must be made to the article on LUPUS. Applications of a solution of perchloride of iron, 120 grains to the ounce, have been attended with great success. Semon has employed the galvanocautery for burning down the lupoid tissue, and has obtained permanent cure. Solutions of lactic acid (20 to 60 per cent.) have also given good results.

F. DE HAVILLAND HALL.

LARYNX, NEUROSES OF.—

Nervous affections of the larynx may be due either to

(A) Altered conditions of the motor nerves, including (1) *paralysis* and (2) *spasm*.

(1) PARALYSIS may affect the abductor, adductor, and tensor muscles of one or on both sides of the larynx.

Bilateral Paralysis of the Abductors (*crico-arytenoidei postici*).—This is a very grave condition and may at any moment cause imminent peril to life.

Symptoms.—The breathing is markedly affected, inspiration being prolonged and stridulous, while expiration is comparatively easy. Any slight exertion causes dyspnoea, and may render the patient more or less cyanosed. The voice is not much altered, though there is often slight hoarseness. The larynx is seen to move up and down with respiration—the so-called “respiratory excursions” of the larynx. Laryngoscopically the cords are found to be sucked together during inspiration, leaving between them a chink of two or three millimetres in width; during expiration the glottis is wider than during inspiration. The cords are generally somewhat congested.

Diagnosis.—The symptoms given above, together with the laryngoscopic appearances, suffice for the diagnosis. In some cases ankylosis of the crico-arytenoid joints may simulate bilateral paralysis of the abductors, but in these cases there is usually some alteration in the configuration of the parts.

Prognosis.—Eliminating hysterical cases, paralysis of central origin is generally incurable. Tracheotomy may pro-

long the patient's life, but as a rule he will be unable to dispense with the canula.

Morbid Anatomy.—Semon has pointed out that there is a distinct "proclivity of the abductor fibres of the recurrent laryngeal nerve to become affected sooner than the adductor fibres, or even exclusively, in cases of undoubted central injury or disease of the roots or trunks of the pneumogastric, spinal accessory, or recurrent nerves."

Degenerative changes may be found in the brain or in the recurrent nerves, and the striation of the posterior crico-arytenoids may be indistinct and the muscles pale in colour and infiltrated with fat.

Ætiology.—In some instances the paralysis is myopathic in origin and arises from a chill. Pressure upon both pneumogastric or both recurrent laryngeal nerves may produce the condition, and the pressure of an aneurysm upon one pneumogastric nerve has been known to cause bilateral paralysis of the abductors.

This paralysis has been found associated with tabes in several instances; it may be an indication of commencing bulbar paralysis, and has been met with in syphilitic and other affections of the brain.

Males are more frequently affected than females. This form of paralysis is rare until adult age has been reached.

Treatment.—Galvanism, massage, and the subcutaneous injection of sulphate of strychnine have been recommended, but are almost always ineffectual. Syphilis and aneurysm, the two most common causes of this condition, are both benefited by large doses of the iodide of potassium, and this drug may often be given with advantage. If attacks of dyspnœa occur, tracheotomy should be performed, and even in cases in which the subjective symptoms become less marked tracheotomy is necessary, unless the improvement be accompanied by an increase in the diameter of the glottis.

Unilateral Abductor Paralysis.

Symptoms.—Paralysis of one abductor is usually accompanied by a certain amount of hoarseness or roughness of the voice. Though the breath may be short on exertion, dyspnœa is not a marked symptom.

Laryngoscopically the affected vocal cord will be seen to be immobile in the median line. After a time the adductors not uncommonly also become paralysed; in this event the cord will occupy the cadaveric position—i.e., midway between abduction and adduction. This is fol-

lowed by relief of the dyspnœa, but the voice undergoes further deterioration.

Diagnosis.—This condition requires to be distinguished from fixation of the cord as a result of disease of the crico-arytenoid joint.

Prognosis.—The affection does not in itself endanger life; the gravity depends upon the fact that it is so frequently due to some grave organic disease.

Morbid Anatomy.—This has been already described under bilateral paralysis of the abductors.

Ætiology.—The most frequent cause of abductor paralysis is pressure upon one pneumogastric or recurrent laryngeal nerve. On the right side this may be brought about by pleural thickening, and on the left, which is more commonly affected, the chief cause is an aneurysm of the transverse aorta.

Bilateral Paralysis of the Adductors (*crico-arytenoidei laterales* and *arytenoideus*).

Symptoms.—There is aphonia, which usually comes on suddenly, and as suddenly disappears. The patient may, however, cough and sneeze quite naturally. When phonation is attempted during a laryngoscopic examination, it is observed that the cords fail to approach the middle line.

Prognosis.—This affection is not attended with any risk to life, and almost invariably terminates with complete restoration of the voice. The writer, however, knows of one case which has resisted the most persevering and energetic treatment, although the vocal mechanism was proved to be perfect by the fact that when the patient was faradised, while under the influence of ether, she called out loudly, but immediately lost her voice on regaining consciousness.

Ætiology.—Anæmia and neurasthenia are the chief causes of bilateral adductor paralysis. It is almost exclusively met with in females, and may occur as a precursor of laryngeal phthisis.

Treatment.—Attempts should be made to improve the general condition of the patient by the administration, for one or two weeks, or longer if necessary, of iron in combination with strychnine. When this has been done, and not until then, the cords should be faradised by means of Morell Mackenzie's electrode, or, if this be not available, by passing the current through the larynx externally.

Unilateral Paralysis of the Adductor Muscles is an extremely rare affection; for a description of it reference must

be made to special works on diseases of the throat.

Paralysis of the Internal Tensors of the Vocal Cords (*thyro-arytenoidei*) is shown by hoarseness and by the elliptical condition of the glottis on attempted phonation. The cords are seen to be relaxed and are usually congested. Overuse of the voice, laryngeal catarrh and anæmia are the chief causes of this condition.

Treatment.—The application of astrin-gents as directed under CHRONIC LARYNGITIS, and the use of the continued or interrupted current and of tonics, are the measures from which most benefit may be expected.

Paralysis of the External Tensors of the Vocal Cords is said to give rise to a rough deep voice, which the patient is unable to modulate in the production of high notes (Gottstein).

(2) SPASM. — Although theoretically spasm may affect any of the muscles of the larynx, it is chiefly in connection with the adductor muscles that it is brought under the notice of the physician. The abductor muscles are more commonly involved in organic disease, whereas the adductors succumb to functional affections.

Symptoms.—A spasmodic contraction of the adductor muscles, with consequent closure of the glottis, is the essential part of laryngismus stridulus, an affection of common occurrence in infancy, which, when met with in the adult, gives rise to much the same symptoms. The patient, usually a young woman, has attacks of difficulty of breathing accompanied by stridor, the voice remaining unaffected. In some cases the spasm persists long enough to cause cyanosis, and, as in childhood, may even cause death. The laryngeal crises which occur in tabes are due to a spasm of the adductors, but the affection is here usually complicated with paresis of the abductors.

Treatment.—When of functional origin, the cold douche, combined with some sternness on the part of the friends, will often suffice to stop the spasm, and the tendency to it may be prevented by the use of the bromides in combination with the ammoniated tincture of valerian or other antispasmodics. If these measures fail, the inhalation of chloroform almost invariably succeeds. There are, however, rare cases in which, to avert death, recourse must be had to tracheotomy.

(B) **Altered Conditions of the Sensory Nerves.**—(1) *Anæsthesia*, (2) *Hy-*

peræsthesia, (3) *Paræsthesia*, (4) *Neuralgia*.

Of these, *Anæsthesia* is the most important condition. It occurs in diphtheritic and bulbar paralysis, in lead poisoning, in epilepsy, and in hysteria. Accompanying diphtheritic paralysis, it may cause serious results, as food may enter the air-passages in consequence of the loss of sensation in the laryngeal mucous membrane. In these cases, patients must be fed by means of the œsophageal tube, care being taken to ensure the tube passing down the œsophagus, and not down the larynx. The administration of iron and strychnine, the latter, if necessary, subcutaneously (gr. $\frac{1}{16}$ to $\frac{1}{15}$), almost invariably has a good effect.

Hyperæsthesia and Paræsthesia frequently occur together in neurotic patients, and sometimes alternate with one another. It must be borne in mind that there may possibly be some underlying cause—*e.g.*, granular pharyngitis, a condition which gives rise to uncomfortable sensations, which may be referred to the larynx. Both hyperæsthesia and paræsthesia of the larynx are aggravated by disordered conditions of the stomach, and may be the expression of irritation reflected from other organs—*e.g.*, the uterus or ovaries.

Treatment.—Attention should be paid to the general health, stomach and other visceral disorders should be appropriately treated, and any local cause of irritation removed, if possible. The bromide of potassium is usually of service; locally, sedatives such as cocaine or morphine may be applied in solution.

Neuralgia of the larynx is a rare complaint, and requires the treatment employed for neuralgic affections of other organs. F. DE HAVILLAND HALL.

LARYNX, OEDEMA OF.—A serous or purulent infiltration of the connective tissue of the larynx in general, and of the ary-epiglottic folds in particular. The term "Edema of the Glottis" is a misnomer; the glottis is a *space*, and cannot therefore become cedematous.

Symptoms.—Difficulty in breathing, which may increase with such rapidity as to threaten life in two or three hours, is the characteristic symptom of edema of the larynx. There is usually also the feeling of a foreign body in the larynx, and there may be difficulty in deglutition; this is the more marked when the epiglottis is much swollen. The voice also becomes weak, or there may be aphonia.

On laryngoscopic examination, the epiglottis may be found to be erect, tense, enormously swollen, and nearly touching the back of the tongue; it is usually of a bright red colour. The ary-epiglottic folds are frequently obscured by the swollen epiglottis, but, if they can be seen, they form plum-like bodies, and may nearly meet in the middle line. In those rare cases in which the œdema is confined to the connective tissue below the cords, red fleshy swellings may be seen bulging from beneath the cords. In the absence of the laryngoscope, the swollen condition of the epiglottis and ary-epiglottic folds may be recognized on making a digital examination.

Diagnosis.—If a laryngoscopic view can be obtained, this is very easy; in its absence it is at times impossible to state with certainty the cause of the obstruction.

The *prognosis* is always grave except in the cases in which the œdema is limited in character.

Morbid Anatomy.—As already stated, the disease consists in an infiltration of the cellular tissue of the larynx with a serous, sero-purulent or purulent fluid. This occurs where the cellular tissue is most lax—i.e., into the epiglottis and the ary-epiglottic folds. The œdema is occasionally limited to the part below the level of the cords, constituting the subglottic variety. The vocal cords themselves are hardly at all affected.

Etiology.—Two forms of the disease have been described—viz., primary and secondary.

Primary œdema comes on suddenly in persons previously healthy, and may arise from a chill, from over-use of the voice, the application of caustics, the use of the galvanocautery, the presence of foreign bodies in the larynx, injuries, swallowing boiling water, and from septic poisoning, the result of defective drainage.

The causes of secondary œdema of the larynx are of an inflammatory, mechanical or dyscrasic nature. It occurs as a complication of infectious diseases, such as erysipelas, small-pox, measles, scarlet fever, typhus or cholera. It is met with in chronic diseases of the larynx, such as tuberculosis, syphilis and carcinoma, and may result from passive congestion in heart and lung affections—e.g., emphysema. The connection of œdema of the larynx with Bright's disease, though insisted on by most writers, is not confirmed on careful examination. Morell Mackenzie investigated 200 cases of

Bright's disease in the London Hospital and did not find a single example of œdema of the larynx, and George Johnson, who speaks with authority both on diseases of the larynx as well as on diseases of the kidneys, does not remember to have seen a case of Bright's disease complicated with œdema of the larynx as a direct result. It is probable, however, that an irritation too slight to cause œdema of the larynx in a healthy individual may suffice to bring it about in an albuminuric patient.

Treatment.—Absolute rest should be enjoined, and the patient forbidden to speak. The writer has found that feeding patients per rectum promotes recovery. Ice pills to suck and an ice-bag to the outside of the larynx should be tried. Bromide of potassium in 20-grain doses every two or three hours has been advocated. Free scarification will often give immediate relief; a 20 per cent. cocaine spray to the pharynx and larynx will facilitate the operation, and may even by itself suffice to give relief. If other measures fail, tracheotomy should be performed, and this should not be deferred until the patient is *in extremis*, but should be had recourse to immediately after the first attack of suffocation experienced by the patient.

F. DE HAVILLAND HALL.

LARYNX, PERICHONDritis OF.—Inflammation of the perichondrium of the larynx leading to death and detachments of a part or the whole of the affected cartilage.

The affection may be primary, but is more often secondary to some other laryngeal disease.

Symptoms.—In primary perichondritis, the first symptom to suggest that the perichondrium is affected is a dull, aching pain, which is increased upon pressure over the larynx. There will be some difficulty in swallowing, especially if, as is usually the case, the cricoid cartilage be implicated. Cough and hoarseness are constant symptoms, and there is dyspnoea in proportion to the degree of obstruction.

At an early stage, laryngoscopic examination may only disclose some swelling of the mucous membrane and perhaps immobility of one vocal cord, and, even when an abscess forms, it is difficult to determine whether or no the perichondrium is affected unless portions of cartilage be expectorated, or a rough area of necrosis be detected by the aid of the laryngeal probe.

In secondary perichondritis the symptoms are less marked, and a diagnosis is often impossible until portions of cartilage have been expectorated, or until perchance a sudden attack of dyspnoea has resulted from the cartilage, suddenly dislodged, becoming impacted in the glottis.

The *prognosis* is very gloomy, as this affection almost always supervenes in the course of some grave disease. If death be not brought about suddenly by spasm of the glottis, by œdema of the larynx, or by the impaction in the glottis of the extruded cartilage, it is due to gradual exhaustion, the pain and discharge giving rise to hectic fever.

Ætiology and Pathology.—Perichondritis is almost invariably secondary to some other affection of the larynx, such as tuberculosis, syphilis, malignant disease, or the ulceration attending typhus and typhoid fevers. The perichondrium is attacked in the progress of the original affection, and is eventually separated from the cartilage by a layer of pus, necrosis being thereby brought about. Perichondritis of the cricoid has been met with in bedridden persons of low vitality. In such cases it has resulted from the pressure of the cricoid against the vertebræ.

Treatment.—This must be directed to warding off the consequences of the inflammation. If an abscess form, it should be opened, and the surgeon must be ready at any moment to perform tracheotomy. In some cases it may be necessary to feed the patient by means of a soft rubber tube or by the rectum.

F. DE HAVILLAND HALL.

LARYNX, SYPHILIS OF.—Syphilitic disease of the larynx may accompany the secondary or tertiary manifestations of the disease, or it may be the result of inherited syphilis.

Symptoms.—In the **Secondary Stage** the patient may complain of hoarseness, which sometimes passes on to complete loss of voice, and a feeling of discomfort in the throat. In a few cases there is an irritating cough.

The laryngoscopic appearances are those of a chronic inflammation. The disease usually runs a tedious course, but presents no characteristic features, so that the diagnosis rests on the discovery of syphilitic lesions in other parts of the body. Condylomata are met with in the larynx, although their occurrence is denied by some writers. They have been seen on the epiglottis, vocal cords and

inter-arytenoid commissure, appearing as oval whitish elevations about three to five millimetres long. They run a rapid course, and hence are doubtless often overlooked.

Tertiary Syphilitic Affections of the larynx are of much more grave import than those met with in the secondary stage, and not unfrequently bring about a fatal termination.

Ulceration is the most common manifestation of tertiary syphilis in the larynx. The ulcer may commence as a superficial loss of substance with a deeply inflamed margin, showing a great tendency to spread laterally. More rarely an ulcer results from the softening and breaking down of a gumma, and the process then extends deeply into the subjacent structures, and may lead to perichondritis with caries, necrosis and subsequent exfoliation of the cartilages. The epiglottis is frequently the seat of ulceration and may be entirely destroyed, and, as a result, there may be attacks of suffocation from food entering the larynx. This, however, rarely happens, as patients are usually able to take food without discomfort in spite of the entire loss of the epiglottis.

A grave danger arises from the formation of cicatrices, consequent upon the healing of the ulcers, a process which may eventually end in stenosis of the larynx. The occurrence of œdema, which may take place at any period during the progress of the disease, may also give rise to alarming symptoms.

Another danger is the tendency to the formation of adhesions between the vocal cords; a web-like membrane may form and unite the cords throughout the greater part of their length, the process in some cases commencing by the cord becoming adherent in the centre. Tracheotomy may become necessary for the relief of this condition.

Sometimes the ulcerative mischief sets up changes in the crico-arytenoid joints, as a result of which ankylosis may occur and the vocal cord may become fixed.

Gummata are but rarely met with, they occur as smooth, roundish swellings, generally only to be distinguished from the surrounding mucous membrane by their elevation, their usual seat being the posterior wall of the larynx.

In some instances perichondritis occurs without previous ulceration of the mucous membrane; if it proceed to suppuration, the abscess which forms may burst in any direction.

In **Inherited Syphilis** the larynx is most commonly affected during the first

six months of life, but the symptoms may not manifest themselves until about the period of puberty.

The classification of lesions into secondary and tertiary, as in the acquired disease, does not hold good. Three forms of laryngeal inflammation may be met with. The first is a chronic superficial laryngitis, in which the changes are limited to the mucosa and sub-mucosa; this may go on to ulceration. In the second form, deep, destructive ulceration occurs similar to that met with in the tertiary stage of acquired syphilis; and the third variety is characterized by the gradual deposit of dense fibrous tissue, which by its contraction may cause stenosis of the larynx.

Diagnosis.—As has already been stated, there is usually nothing in the laryngeal affection of secondary syphilis which would enable one to make a diagnosis in the absence of collateral information; it therefore rests on the presence of luetic affections of the skin and mucous membranes and eyes.

In the tertiary stage the diagnosis has to be made from phthisis and from cancer. The differential diagnosis from phthisis is discussed under the head of TUBERCULOSIS OF THE LARYNX. From cancer the diagnosis is at first sometimes a matter of difficulty, but in the latter a new growth usually precedes the ulcerative stage, the progress is a much slower one, and pain is a more common symptom; still, some doubt so often exists that it is advisable to subject the patient to a course of specific treatment before definitely deciding against syphilis and in favour of malignant disease. But even if the patient improve under treatment, it must be remembered that syphilis and cancer are occasionally associated, and specific treatment may thus produce marked improvement for a time.

Prognosis.—This varies with the stage of the disease. The secondary affections of the larynx, though occasionally troublesome from their chronicity, give no other cause for uneasiness; on the other hand, tertiary syphilis of the larynx may cause death from acute oedema, or the glottis may become suddenly obstructed by portions of cartilage which have exfoliated, or deep ulceration may extend into a large vessel and give rise to fatal hæmorrhage. Lastly, the dangers incidental to stenosis of the larynx, which will necessitate tracheotomy, must be borne in mind.

Even after tracheotomy has been performed, a hyperplastic process may extend from the larynx down the trachea, and

eventually cause death. Though a gloomy picture has been drawn of the possibilities attendant upon syphilis of the larynx, nevertheless marked improvement may take place in cases, apparently desperate, when they are subjected to anti-syphilitic treatment. Ulceration is often arrested, swelling disappears, and the normal outline of parts can again be recognized. In young children suffering from congenital syphilis there is an additional element of danger in the small size of the glottis, and the consequent great risk of death from asphyxia.

Treatment.—As a rule, local treatment is of little avail, but astringent applications, such as 10 to 30 grains of chloride of zinc or 15 grains of sulphate of copper to the ounce of water, may assist in clearing up a syphilitic laryngitis; and in tertiary ulcers of the larynx the insufflation of iodoform or iodol (as advised for laryngeal tuberculosis) has given good results. Constitutional treatment is all-important. In the laryngeal phenomena accompanying the secondary stage of syphilis, it is generally advisable to commence with mercury, which can be given either by inunction of $\frac{1}{2}$ drachm of blue ointment daily, or, internally, in the form of blue pill (gr. j-ij), or grey powder (gr. j-ij), or the solution of the perchloride in drachm doses in a bitter infusion. The dose of any one of the three should be taken two or three times a day.

After some weeks of the mercurial treatment, the addition of 5 grains of the iodide of potassium to the mixture containing the solution of the perchloride is generally indicated.

Cases of tertiary syphilis of the larynx sometimes require the most energetic treatment in order to prevent death from asphyxia due to occlusion of the glottis. Though, as a rule, iodide of potassium in doses of from 5 to 30 grains, or even more, every six hours will effect a speedy improvement, there are cases, and these usually the most threatening, in which the administration of mercury as well as of iodide of potassium is necessary. The patient should remain in bed, the room being kept at a uniform temperature, and every four or six hours he should take 10 to 30 grains of the iodide, and twice daily 20 grains of blue ointment should be rubbed into the axillæ or inner sides of the thigh.

Tracheotomy must, of course, be performed if life be endangered by laryngeal stenosis, but the subsequent removal of the canula is usually a matter of great difficulty. Cases of laryngeal stenosis

consequent on cicatricial contraction have been cured by means of gradual dilatation by bougies, &c., but the writer has not been fortunate enough to have succeeded in such cases. Too much stress cannot be laid on the importance of preventing the formation of adhesions between the cords; this can be done by the daily application, by means of the laryngeal brush, of an astringent such as 10 to 30 grains of nitrate of silver or 10 to 20 grains of the sulphate of copper to the ounce of water, or, if necessary, by the introduction of Schroetter's hollow bougies. F. DE HAVILLAND HALL.

LARYNX, TUBERCULOSIS OF (Tubercular Laryngitis; Laryngeal Phthisis).—A chronic disease of the larynx depending on the presence of tubercle, almost invariably associated with pulmonary tuberculosis.

A few cases have been recorded in which the laryngeal affection was primary, and in which no tubercular lesions were present in the lungs.

Symptoms.—The symptoms of tuberculosis of the larynx are so intimately blended with those of the pulmonary affection that it is difficult at times to assign the due share to each organ; even hoarseness, which might be considered essentially a laryngeal symptom, may be owing to an implication of one of the recurrent laryngeal nerves (more commonly the right), in a lesion of the lungs or of the bronchial glands. Hoarseness is an early symptom of the disease, and frequently passes into complete loss of voice; cough and expectoration are invariably present as the result of the combined laryngeal and pulmonary affection. One of the most painful and characteristic of the symptoms of laryngeal phthisis is dysphagia, due to the swollen and ulcerated condition of the larynx. If the epiglottis, from destruction or otherwise, be unable to close the glottis, distressing attacks of coughing and suffocation ensue upon attempting to take food, so that the patient may suffer greatly from malnutrition. The shortness of breath usually observed in laryngeal phthisis is, in many cases, due to the pulmonary mischief. Dyspnoea of sufficient moment to necessitate tracheotomy is rare, but it may come on at any time from oedema of the larynx or more gradually from fixation of the vocal cords in the median position, a condition simulating bilateral abductor paralysis, and brought about by changes in and around the crico-arytenoid joints.

Laryngoscopically one of the earliest signs to suggest the onset of tubercular disease is pallor of the laryngeal mucous membrane. This may be due simply to general anæmia, but its existence should suggest the necessity for a thorough examination of the lungs. Very frequently laryngeal tuberculosis is ushered in with the signs of a chronic laryngitis, and it is only the presence of lung mischief or the further development of the case which leads to the diagnosis. A very suspicious condition is a serrated appearance of the inter-arytenoid fold of mucous membrane; later on, this may be the seat of an ulcer.

The later stages of laryngeal tuberculosis are very characteristic; the epiglottis becomes thickened and turban-like, and the ary-epiglottic folds form pyriform tumours, the mucous membrane covering the swollen parts being pale. Later on, small ulcers appear, and these may eventually coalesce and give rise to a large patch of ulceration, usually covered with a milky-white secretion. In a few cases tuberculous tumours have been recognized in the larynx, and even removed, during life.

As regards the condition of the vocal cords, it is common to find some congestion and thickening and, in the later stages, ulceration. Loss of mobility in one or both vocal cords is also very frequently observed. This may be due to functional causes, as is the case in hysteria, or degenerative changes may have taken place in the laryngeal muscles themselves; there may be paralysis from pressure upon the motor nerves to the larynx; or, lastly, there may be some mechanical condition, such as swelling of the soft parts, preventing the approximation of the cords, or ankylosis or other disease of the crico-arytenoid joint.

Sluggish action or, as it has been termed, *lameness* of one cord has been thought to point to tubercular disease in the corresponding lung, but this is very problematical.

Diagnosis.—In the early stages, when there is merely pallor of the mucous membrane or congestion of the cords, the diagnosis must, to a large extent, depend upon the result of an examination of the lungs, as there is at this time nothing characteristic in the appearance of the larynx. The pale, puffy swelling of the epiglottis and ary-epiglottic folds is pathognomonic. Where ulceration is the chief feature, syphilis and cancer have to be excluded. The withdrawal of some of the secretion from the larynx by

means of a brush under guidance of the laryngeal mirror, and the discovery of bacilli, will settle the point in favour of tuberculosis. As a rule, the ulcerative process is slower in tuberculosis than in syphilis, the ulcers are smaller, more numerous, and are seated on a paler base. In making a diagnosis, however, it must be borne in mind that syphilis and phthisis may co-exist, and that a case originally syphilitic may take on a tubercular transformation. Ulceration attacking one cord alone is in favour of syphilis. Tuberculosis of the larynx may usually be differentiated from malignant disease by the presence of pulmonary phthisis, the pallor of the pharynx and larynx, the pale, puffy swelling of the arytenoids, and by the fact that, as a rule, both sides of the larynx are implicated. The ulcers of laryngeal phthisis are usually small and multiple, a single large ulcer being more characteristic of malignant disease. The age of the patient will often aid in the diagnosis, as malignant disease is rare under thirty-five, whereas laryngeal phthisis is most common between the ages of twenty and thirty, and three-quarters of the cases, according to Morell Mackenzie, occur under the age of forty. As already mentioned, the discovery of the tubercle bacillus will clinch the diagnosis.

Prognosis.—Though cases of arrest and even cure of tubercular ulceration of the larynx have from time to time been recorded, and especially within the last few years, as the outcome of the recent advances in the local treatment of the disease, nevertheless it must be confessed that the outlook of a patient with laryngeal tuberculosis is a gloomy one. Morell Mackenzie's statistics show that of one hundred cases submitted to post-mortem examination twenty-six died in the first twelve months, fifty-six within eighteen months, and seventy-five within two years, and only twelve lived upwards of two and a-half years. Since these figures were compiled the state of affairs has somewhat improved, though it cannot yet be said that the treatment of this condition is attended with much success.

Pathology.—At the autopsy there will usually be found swelling of the mucous membrane, due to cellular infiltration of the mucosa and sub-mucosa, associated with tubercles, which in rare cases have been described as constituting small nodules on the surface of the mucous membrane. The tubercles soon break down, forming superficial ulcers, which, by extending into the deeper tissues, lead

to perichondritis, with necrosis and exfoliation of the cartilages. Tubercle bacilli are found in the secretion bathing the surface of the ulcers, and in the giant-cell systems.

Ætiology.—Laryngeal tuberculosis is met with in about 30 per cent. of the cases of pulmonary tuberculosis, and, as already stated, it is usually secondary to the disease of the lung, though cases have been recorded in which, at the autopsy, tubercular disease of the larynx has been found without any deposit in the lungs. It seems probable that syphilitic ulceration of the larynx may predispose to laryngeal tuberculosis by affording a good nidus for the development of the tubercle bacillus.

Treatment.—The constitutional treatment is the same as that which is found useful in cases of pulmonary tuberculosis, except that high altitudes are not suitable to sufferers from laryngeal phthisis. The local treatment is very important, and of late years encouraging advances have been made in this department, especially in the direction of the destruction of the morbid tissues and the promotion of cicatrization of ulcers. Sedative and antiseptic inhalations are often beneficial. Cocaine has almost superseded morphine as a remedy for dysphagia; it may be applied in a 5 or 10 per cent. solution, by means of either a spray apparatus or brush, five minutes before a meal is taken. The difficulty in swallowing liquids which attends loss of the epiglottis by ulceration may be obviated by placing the patient prone across the bed, with the head hanging over the side, and allowing him to suck milk by means of a piece of india-rubber tubing from a mug placed on the floor (Wolfenden).

Painting the ulcerated surface with a 5 to 20 per cent. solution of menthol in olive oil causes but little discomfort, while it relieves pain and dysphagia and promotes the cicatrization of the ulcers. The insufflation twice daily of a powder composed of iodol (or iodoform) and boric acid, of each 1 grain, and of hydrochlorate of cocaine and hydrochlorate of morphine, of each $\frac{1}{2}$ to $\frac{1}{3}$ grain, after cleansing the surface of the ulcer with an alkaline spray, can be confidently recommended. Lactic acid in a 20 to 60 per cent. solution has been found very useful in destroying the infiltrated tissues and causing the formation of a cicatrix. The application is very painful, but the pain may be lessened by painting a 20 per cent. solution of cocaine over the mucous membrane previously, and by the

use of gargles of ice-water and cold compresses.

Curettage the infiltrated tissues and bases of ulcers has been tried, and the operation may be followed by the application of lactic acid.

Tracheotomy as a curative measure has not received much support; by the great majority this operation is restricted to cases where life is immediately threatened by laryngeal stenosis.

F. DE HAVILLAND HALL.

LARYNX, TUMOURS OF, MALIGNANT.—New formations of a malignant nature growing from the mucous membrane of the larynx.

Intrinsic malignant disease of the larynx includes tumours growing from the ventricular bands, the ventricles, the vocal cords, and the parts immediately below the cords. The term *extrinsic* is applied to growths taking their origin from the epiglottis, the ary-epiglottic folds, the inter-arytenoid fold, &c. The intrinsic form occurs in by far the greater number of cases.

Symptoms.—Hoarseness is one of the earliest symptoms of intrinsic cancer of the larynx, and though it generally increases with the progress of the disease, the voice is hardly ever entirely lost. Pain in many cases comes on very early, but it may be quite absent, of so trivial a nature, or so temporary, as not to form an important feature of the disease. Extension of pain to the ear is in no way pathognomonic of cancer, as it is also present in other chronic laryngeal diseases. Cough is not a constant symptom; there is usually, however, an increased secretion of mucus, and late on in the disease the expectoration as well as the breath of the patient may be offensive.

Hæmorrhage, especially if abundant, points to malignant disease. The degree of dyspnoea will depend on the amount of obstruction to the lumen of the larynx, whereas dysphagia is affected by the situation of the growth, being present when the posterior wall is attacked or the epiglottis implicated. Cachexia, such as is met with in malignant diseases of other organs is not a marked feature of the laryngeal affection.

Objectively, though there is nothing absolutely distinctive in the appearance of laryngeal cancer, still the experienced observer will generally be able to form a correct opinion from an examination of the parts.

Cancer of the larynx is eminently a polymorphic disease, thus it may simulate

a papilloma or a fibroma, and in rare cases the growth is even distinctly pedunculated.

A fringe-like growth attached to nearly the whole length of a cord, and even extending to the ventricular band, the arytenoid cartilage and the ary-epiglottic fold, the other half of the larynx being healthy, is, according to Semon, very suggestive of cancer when it occurs in a patient above fifty. The same observer has rightly emphasized the importance of impaired mobility of the affected cord as a diagnostic sign of cancer.

Malignant growths most frequently spring from the ventricular bands, and the posterior part of the larynx is attacked by preference.

In the later stages of the disease the soft parts of the larynx may become infiltrated, and finally perichondritis may result, and the malignant growth may even penetrate the skin and appear externally. Enlargement of lymphatic glands is very rare with intrinsic, common with extrinsic cancer of the larynx.

Diagnosis.—Age is an important factor in arriving at a conclusion; thus, in a patient above thirty-five, in whom a laryngeal growth is detected, the *possibility* of this being of a malignant nature should be contemplated, and after the fiftieth year the *probability*. The position of the growth at the posterior part of the larynx, and the immobility of the affected cord, have been already mentioned as diagnostic points in favour of cancer. Microscopic examination of portions of the growth, removed for the purpose, or expelled by cough, is only of decisive value when the growth is found to be malignant; a merely negative result is of little or no significance.

For the diagnosis of malignant disease of the larynx from syphilitic and tubercular affections of that organ, the articles on SYPHILIS and TUBERCULOSIS OF THE LARYNX may be consulted.

Prognosis.—Intrinsic carcinoma of the larynx is not so quickly fatal as the extrinsic form; still, death may occur within the year, but on the other hand it does not usually occur under eighteen months, and may even be delayed three, four or more years. In extrinsic carcinoma the duration of life is considerably shorter.

Morbid Anatomy.—Malignant tumours of the larynx include the sarcomata and the carcinomata, the latter occurring much more frequently than the former. The anatomical peculiarities of these growths in the larynx differ in no respect from similar growths elsewhere, and it

need only be said that epithelioma (squamous-celled carcinoma) is by far the most common form of malignant disease affecting the larynx.

Treatment.—When once the diagnosis of malignant disease has been satisfactorily established it is not advisable to attempt to remove the growth *per vias naturales*, though in a few cases in which this procedure has been carried out the patients have been free from recurrence for upwards of two years, and Schnitzler has recorded a case in which the patient was alive and well twenty-one years after the intra-laryngeal removal of a tumour diagnosed clinically and microscopically to be epithelioma.

In cases which are not suited for more radical treatment, and in which dyspnoea is an urgent symptom, tracheotomy will in a large number of instances prolong the duration of life.

Partial excision of the larynx for malignant disease, if undertaken at an early period, promises to be a very successful operation, and is attended with but slight immediate risk to the patient, whereas complete removal of the larynx has yet to justify its performance, as the mortality due to the operation is very great, and the after results have been anything but satisfactory. Many of the patients, so far from being bettered by the operation, were placed in a worse position by it.

In the event of no operative treatment being determined on, attempts may be made to relieve the pain and dysphagia by insufflations of morphia, gr. $\frac{1}{8}$ to $\frac{1}{2}$, or the application of a 20 per cent. solution of cocaine by means of the spray or brush. In some cases it may be necessary to feed the patient *per rectum*.

F. DE HAVILLAND HALL.

LARYNX, TUMOURS OF, NON-MALIGNANT.—Growths of a benign character, projecting from the mucous membrane of the larynx.

All the growths met with in other organs of the body may have their counterpart in the larynx. According to Morell Mackenzie, papillomata are by far the most frequent, sixty-seven out of a hundred cases being deemed to be of this nature; fibromata come next in frequency with eleven cases. Cysts are comparatively rare.

Symptoms.—The symptom which is most commonly complained of is some alteration in the voice. This may vary from slight hoarseness up to complete aphonia. The degree of loss of voice does not depend upon the size of the growth: a

small sessile tumour will often cause much greater hoarseness than a larger tumour, which, by being pedunculated, does not interfere with the vibration of the cord to the same extent. Should the pedicle be long, and the polyp freely movable in the respiratory current, the condition of the voice will vary very much, according to the position of the polyp; at one moment the patient may be able to speak in a natural voice, at the next he may be almost aphonic, on account of the growth being caught between the cords. Cough is not a constant symptom. The majority of patients with laryngeal growths are free from it, but in a certain number it is a very troublesome complaint, being hacking or irritating in character. Dyspnoea depends almost entirely on the size of the growth, and to a less extent on its position. For example, tumours springing from the margin of the glottis are much more likely to cause dyspnoea than those originating from the epiglottis, and which consequently obstruct the air-passage less. Dysphagia is only met with in cases where, on account of the size of the growth, there is some mechanical interference with the act of swallowing, or when it is seated on the epiglottis. Pain is almost invariably absent.

Diagnosis.—This is usually to be effected by means of the laryngoscope, and may be confirmed by the microscopic examination of portions of the growth expectorated by the patient or removed by the surgeon. The diagnosis between malignant and non-malignant growths is discussed under the former heading. The condylomata of secondary syphilis are to be distinguished by the rapidity with which they disappear under treatment. Gummata and the excrescences met with in tertiary syphilis might possibly mislead, but attention to the general condition of the larynx, and the help furnished by constitutional symptoms, should prevent error; the same holds good in the case of tubercular infiltration or tubercular tumours. But the possibility of the co-existence of tertiary syphilis or phthisis and an independent papilloma, or other growths in the larynx, should be remembered. In a case of phthisis with hoarseness observed by the writer, the appearances were at first those of a chronic laryngitis with thickening of the left vocal cord, and were compatible with the diagnosis of laryngeal tuberculosis, secondary to pulmonary phthisis. After an interval of three years a growth the size of a small cherry was found attached to one of the

vocal cords, occupying about two-thirds of its length. The results of treatment proved that the laryngeal condition was quite unconnected with that of the lungs.

Prognosis.—This has to be considered with regard to (1) the danger to life and (2) the state of the voice. The danger to life is comparatively small, as even in those rare cases in which the growth cannot be removed *per vias naturales* there is always the possibility of recourse to tracheotomy, and if this operation be not unduly postponed the risk to life is small.

As regards the voice, greater caution is needed in expressing an opinion. Some growths may after a time remain stationary, and cease to give trouble. A distinguished singer, who had a sessile growth (probably a fibroma) seated on the left cord, is known to have pursued his profession without any apparent damage to the voice. A single growth, especially if pedunculated, can generally be so completely removed that the restoration of voice may be confidently predicted; on the other hand, in the case of multiple and recurrent papillomata the prognosis is much less favourable. Thanks to the introduction of cocaine, the operative procedures for the removal of laryngeal growths have been greatly facilitated.

Pathology.—Papillomata are composed of a basis of connective tissue supporting blood-vessels, and covered with epithelium. They may be sessile or pedunculated, and either single or multiple. They often present a cauliflower-like appearance, and most commonly grow from the vocal cords. Papillomata are generally of a pinkish colour, but they may be greyish or white.

Fibromata consist of firm, dense, fibrous tissue but sparingly supplied with blood-vessels. The surface is usually smooth, and the colour varies from white to pink. When growing on a vocal cord a fibroma can often only be recognized by its shape, as in colour it is indistinguishable from the cord. Fibromata may be sessile or pedunculated, and are usually oval or round.

Cysts generally spring from the epiglottis, or from the laryngeal ventricles, and vary in size from a pin's-head to a bantam's egg (Semon). They may be classed among retention-cysts.

Etiology.—Any cause of irritation seems sufficient to serve as the starting-point of non-malignant growths in the larynx, hence chronic laryngitis is the most frequent precursor. Congenital growths have been described.

Treatment.—Recent experience has fully confirmed the following statement enunciated at the International Medical Congress of 1881:—"Every benign laryngeal tumour ought, if possible, to be removed *per vias naturales*, and only if an experienced laryngologist has established the inexpediency of this method may the extra-laryngeal operation be adopted." Of the various methods of removal, Morell Mackenzie's cutting forceps are most generally serviceable, but the galvano-caustic loop will at times render valuable assistance. Painting or spraying the pharynx and larynx with a 20 per cent. solution of the hydrochlorate of cocaine greatly facilitates intra-laryngeal operations. All caustic applications to benign growths in the larynx are to be condemned; they can do no good, and may, by exciting spasm or inflammation, render tracheotomy necessary. Some growths, notably fibromata, as already mentioned, after a time remain stationary, and may not require treatment. The fear, which has been expressed by some writers, that repeated attempts at the removal of benign new growths by the endo-laryngeal method may result in the conversion of benign into malignant growths, in consequence of the irritation to which they may have been exposed, has been shown to be utterly groundless. The collective investigation started by Semon, as editor of the *Centralblatt für Laryngologie*, has resulted in the collection of 10,747 cases of benign new formations in the larynx, and of these, 8216 were operated on by the endo-laryngeal method. A transformation of growths apparently benign into malignant is reported in 32 out of the 8216 cases; therefore, in less than a $\frac{1}{2}$ per cent. of all operation cases. But when these 32 cases come to be carefully analysed, in only 4 was the evidence absolutely in favour of this transformation; of the remainder, in some it was probable, in others very dubious. Moreover, it must be borne in mind that this transformation of benign into malignant growths is reported in cases which were never subjected to operative interference.

F. DE HAVILLAND HALL.

LATERAL SCLEROSIS, AMYOTROPHIC.—A combined system-lesion of the lateral columns and anterior grey matter characterized clinically by motor weakness and rigidity of limbs, with early supervention of muscular atrophy and involvement of the nuclei in the medulla oblongata.

Symptoms.—The disease begins with weakness and rigidity of the arms, soon followed by general wasting of the muscles, with fibrillar twitchings. Contractions rapidly supervene in the upper limbs. The arm is applied to the side of the body, the forearm is semi-flexed and pronated, and the hand and fingers flexed. Much force is required to overcome this permanent rigid state, and such attempts excite pain.

In a few months the wasting becomes extreme, but the spasm still persists, though possibly to a less degree. The muscles of the neck sometimes become stiff and then feeble, so that the head is flail-like, falling forwards or backwards or to one or the other side.

Within a year the lower limbs become weak and rigid, presenting the usual features of spasmodic paralysis. Wasting of the lower limbs, however, is by no means constant, as is the case with the upper extremities. In the third stage bulbar paralysis supervenes, the face, lips, tongue, pharynx and larynx becoming involved. Throughout the disease the tendon reflexes are much exaggerated, and clonus is readily elicited. The bladder and rectum remain unaffected, and sensation is unimpaired.

Diagnosis.—It may be here remarked that Charcot's contention, that the grouping of symptoms just mentioned constitutes a definite morbid state, has not been universally accepted. Leyden, Gowers, and others are of opinion that cases of amyotrophic lateral sclerosis belong to the category either of lateral sclerosis with consecutive muscular atrophy or to progressive muscular atrophy with degeneration of the pyramidal tracts, and that the extension of the lesion in one or the other case is accidental.

It is, however, pretty generally admitted that symptoms referable to disease of the lateral columns and of the anterior grey matter occur in the order already described, and that in such cases early implication of the medulla oblongata takes place.

The clinical account above given indicates the points of difference between amyotrophic lateral sclerosis and the two affections with which it may be confounded—viz., lateral sclerosis and progressive muscular atrophy. As regards the disease under consideration, it should be stated that the loss of power precedes the wasting, and that the atrophy attacks all the muscles of a limb simultaneously. In progressive muscular atrophy, the weakness and

muscular wasting, occur together and are proportional; the atrophy, moreover, attacks the muscles according to their physiological grouping.

Prognosis.—According to Charcot, death ensues within three years from the commencement—sometimes earlier.

Morbid Anatomy.—The direct and crossed pyramidal tracts in the cord, the anterior pyramids of the medulla, and the pyramidal tract at some levels higher up have been found sclerosed. The anterior grey matter of the cord and the nuclei in the medulla are atrophied, and the nerves proceeding from them degenerated. The affected muscles undergo great atrophy, with degenerative changes.

Etiology.—On this point nothing definite is known.

Treatment.—No remedies seem to have any influence on the course of the disease. The treatment can only be palliative.

W. B. HADDEN.

LATERAL SCLEROSIS, PRIMARY (Spasmodic Tabes Dorsalis; Spasmodic Spinal Paralysis).—A disease characterized clinically by paralysis of the limbs, with rigidity and increased tendon-reflexes, and absence of sensory and nutritive disorders.

The anatomical change is a primary sclerosis of the pyramidal tracts.

Symptoms.—The disease begins gradually with weakness of the legs, followed by dragging of the feet, muscular twitching, and later on by muscular rigidity. The spasm, at first intermittent, finally becomes permanent. The lower extremities become fixed in a position of extension, the thighs being strongly adducted, and the feet in the position of talipes equino-varus.

The characteristic spastic gait is now evident. During progression each lower limb is brought forward as a whole, the knee being stiff and the toes dragging along the ground. As the ball of the foot rests on the ground, clonus of the limb is set up by extension of the calf muscles. In this way the gait has imparted to it a peculiar jerking or hopping character.

As the disease progresses, the lower limbs become weaker and stiffer, and walking may become impossible.

In occasional cases, the extensor spasm gives way to flexion, temporary at first, and finally becoming persistent. The affected limbs are from an early period liable to spasmodic contractions and tremblings, and later on clonus of the limb can be readily excited by slight stimuli, and may even occur spontane-

ously. Increased tendon reactions, with ankle and knee clonus, are present throughout, though in the later period they are often difficult to obtain in consequence of the intensity of the spasm. The plantar reflex is either normal or slightly increased. Not uncommonly the weakness and rigidity extend upwards, involving first the muscles of the back and abdomen and then the upper extremities. When the latter are implicated, the rigid condition is that of flexion. The arm is fixed to the side of the body, the forearm pronated and semi-flexed, and the wrists and fingers strongly flexed.

It must be mentioned that the muscles do not undergo atrophy, and that their electrical reactions are either normal or slightly diminished.

Subjective feelings of numbness, tingling and the like are not infrequent, but sensory disorders, properly speaking, are absent. The sphincters are rarely affected, and sexual power is as a rule preserved.

The progress of the disease is liable to many variations, and its course is essentially chronic. Sometimes the lower limbs alone are involved, and the affection may never become extreme. In rare instances the disease has a hemiplegic distribution, and now and then the upper limbs are attacked before the lower.

Diagnosis.—Slowly increasing weakness of the lower limbs with rigidity occurs in various morbid states, and it is often impossible to determine the exact nature of the lesion. A careful inquiry should be made into the mode of commencement of the attack. An acute onset followed by slowly advancing paraplegic rigidity suggests a focal lesion followed by descending degeneration of the pyramidal tracts.

An examination of the back should always be made. The presence of an angular curvature would of course be practically conclusive against a primary lateral sclerosis. The existence of localized tenderness or of rigidity of the spine, apart from irregularity, should excite the suspicion of caries.

Again, in disseminated sclerosis a spasmodic paraplegia is not uncommonly the first indication of the disease, and it may be the sole condition for a long time. Sooner or later, however, other symptoms usually arise, such as nystagmus, tremors of the hands, head or tongue, or affection of speech, which will enable one to pronounce a definite diagnosis.

Hysterical paraplegia with spasm may be mistaken for lateral sclerosis. In the former, however, ankle and knee clonus, although sometimes present, have not the same persistency as in organic disease, and it is asserted that the contraction is more fixed than in lateral sclerosis. Practically, however, there is often considerable difficulty in diagnosing between these conditions, and the difficulty is increased by the probability that in prolonged cases of functional spasm of the lower limbs organic change occurs in the lateral columns.

The diagnosis of a primary system lesion of the pyramidal tracts is often a matter of great difficulty, and the presence of this condition should not be entertained until all other morbid states, of which spasmodic paraplegia forms a part, are excluded. This however is frequently impossible, and hence the existence of primary lateral sclerosis often cannot be positively affirmed.

The difference between primary lateral sclerosis and amyotrophic lateral sclerosis will be found under the description of the latter.

Prognosis.—The disease is usually slowly progressive, and extends over many years. In rare cases improvement to a considerable extent has been recorded, and it has even been asserted that recovery has taken place.

Morbid Anatomy.—The direct and crossed pyramidal tracts are sclerosed, and their upward prolongations in the medulla, pons, crura, and cerebral hemispheres as far as the motor cortex, have been found degenerated.

Etiology.—Males are more commonly affected than females, and the onset usually occurs between the ages of twenty and fifty. Syphilis, injury to the back, exposure to wet and cold are alleged to have some share either as predisposing or exciting agents.

Treatment.—Prolonged rest, massage of the limbs, and Turkish baths are useful. Bromide of potassium, cannabis indica, opium and belladonna have little effect, and that merely temporary. Electricity, nux vomica, and strychnine are contra-indicated, as they tend to cause increased spasm. The treatment by suspension (*see under LOCOMOTOR ATAXY*) deserves a trial.

W. B. HADDEN.

LEAD, Poisoning by (Plumbism ; Saturnism).—For convenience of description this subject may be considered under the following headings :—

ACUTE POISONING BY LEAD.**A. Accidental and Suicidal.****B. Acute Poisoning of Lead Workers.****CHRONIC POISONING BY LEAD.**

ACUTE POISONING BY LEAD.—A. Accidental and Suicidal.—The salts of lead are not often chosen by the would-be suicide, and cases of accidental poisoning are by no means common.

The acetate or sugar of lead is the salt most often taken, but its poisonous properties are feeble, and recovery has followed when an ounce has been swallowed.

Symptoms.—The chief symptoms are a metallic taste, with dryness and burning in the mouth, followed by vomiting and pain in the abdomen. The pulse is small and frequent, the urine is scanty, and cramps and pains in the limbs are complained of.

Prognosis.—Recovery is the usual termination in such cases.

Post-mortem Appearances.—The mucous membrane of the stomach and intestines is generally coated with a thick layer of whitish or yellow mucus, and may show traces of inflammation. Lead may be found in various organs on chemical examination (*vide infra*).

Treatment.—Vomiting should be encouraged, and the stomach washed out. Dilute sulphuric acid (℥xxx in water) or the sulphate of magnesia or soda (℥ss) should be at once administered, freely diluted with water, or all three may be given together. The patient should be allowed to drink freely of milk, or white of egg and water. If there be severe pain a hypodermic injection of morphine (gr. $\frac{1}{4}$) should be administered, and poultices applied to the abdomen. Subsequently a course of iodide of potassium is advisable with a view to eliminate the metal from the system.

B. Acute Poisoning of Lead Workers.—Although the more common effect of the absorption of the metal upon those engaged in lead works is to produce the symptoms described under Chronic Poisoning, nevertheless cases of a very acute and fatal character are occasionally met with.

Symptoms.—The first symptom observed is anæmia, which rapidly increases in degree, and is followed by vomiting, colic, and headache. A blue line quickly appears on the gums. Optic neuritis is often present, and there may be neuroretinitis, and either diplopia or amblyopia. The temperature may be slightly

raised. After an illness perhaps of only a few days' duration, the patient may be suddenly seized with acute cerebral symptoms, such as convulsions of an epileptiform character, and delirium. On recovery from the fits the mental condition of the patient may simulate that produced by taking an excess of alcohol (Stephen Mackenzie). The convulsions may recur, and be followed by coma and death.

Prognosis.—This is very grave in cases marked by the presence of acute cerebral symptoms, especially convulsions and coma, but recovery has been known to take place after convulsions even when double optic neuritis was present. Recovery is usually complete in the non-fatal cases.

Morbid Anatomy.—In the most acute cases no alterations of the viscera can be found after death other than an hydræmic condition of the brain (Oliver).

The other morbid appearances are described under Chronic Poisoning.

Etiology.—All observers agree that there is in these very acute cases a predisposition on the part of the individual, and probably the predisposition also runs in families. Those recently employed in lead works are much more likely to suffer than old hands. Dr. Stephen Mackenzie has suggested that the attacks of acute toxæmia are more frequent in the winter than in the summer. Such cases have been more often met with in females than males, but it is somewhat uncertain whether, for equal numbers, women employed in lead works are affected more or less than men.

Treatment.—Acute cases such as those above described do not occur in lead works under proper medical supervision, where careful and systematic examination of all new hands is enforced, and such an examination should be made compulsory by legal enactment. Any such employé showing signs of poisoning should be recommended to adopt some other occupation.

The sulphates of magnesia and soda should be freely administered, with opium or morphine by subcutaneous injection if colic be present. When the symptoms are acute, iodide of potassium should not be given, as the toxic effects may be thereby increased, owing to the sudden liberation of lead which has been fixed in the tissues and which then passes into the blood.

The subsequent treatment is similar to that described in the following section.

CHRONIC POISONING BY LEAD.—Lead may gain entrance into the body in a

variety of ways, but only the most common can be mentioned here.

Persons engaged in lead works, and those who handle the metal or its alloys in the course of their occupation—such as painters, compositors, typefounders, and white enamellers—naturally suffer most frequently; but in many cases of chronic poisoning the occurrence may be described as accidental.

The drinking water may be contaminated in passing through leaden pipes, and the first pint of beer drawn in the morning, if it have remained all night in lead pipes, will, in time, poison the regular early tippler. Wines or beverages (*e.g.*, cyder) may contain the metal from the use of leaden presses in the process of manufacture; fine particles of lead may become mixed with the flour if the cracks in the stones of a corn-mill have been filled up with the metal; and acid foods may dissolve it out of the glaze on vessels in domestic use.

Symptoms.—The primary effect of the presence of lead in the body is the production of anæmia, which is followed later by a cachexia to which the name of “saturnine” has been given.

The other effects of lead may be conveniently described under the headings of the respective systems.

Digestive System.—The so-called *blue line* on the gums is due to the deposit of fine particles of sulphide of lead in the papillæ of the gums, and first appears as a single row of distinct black spots, which subsequently increase in number. The metal is absorbed from the blood, and, after conversion into a sulphide by the action of the sulphuretted hydrogen in the albuminous matters which are either contained in the tartar or deposited between the gum and the tooth, it is fixed in and around the vessels of the papillæ. A similar deposit of sulphide of lead may form in the mucous membrane of the upper or lower lip where it comes into contact with an accumulation of tartar on the teeth. The blue line may form very rapidly, in a few days even. The line, when once formed, remains for a considerable time, possibly for as long as a year (Gowers); but on this point there is some divergence of opinion. When absent, the blue line may sometimes be produced by the administration of iodide of potassium if lead be present in the system, as this salt combines with the metal to form a soluble iodide.

Constipation is one of the early symptoms of this condition, and is usually associated with such signs of dyspepsia

as vomiting, a furred tongue, and foul breath.

Colic (*colica pictorum*), perhaps, comes next in order of frequency; but in acute cases vomiting usually precedes colic and constipation. The attacks are marked by excruciating abdominal pain, which is, as a rule, relieved by firm pressure. The abdomen is hard and retracted. The pulse is slow, and the arterial tension is raised. Although doubted by some observers, the pain is probably actually due to spasmodic contraction of the colon, and the attack is therefore truly “colic.”

Nervous and Muscular Systems.—Pains in the limbs are of common occurrence, and are often neuralgic in character; the muscles may be tender on pressure. In the ætiology of neuritis (*q.v.*), or, as it is generally termed, “peripheral neuritis,” lead plays an important part.

Dr. Gowers distinguishes two varieties of lead paralysis—the “degenerative” and the “primary atrophic” forms. In the former, which is the one most frequently met with, the loss of power precedes the wasting, and the muscles present the reaction of degeneration. In the latter, the weakness and wasting come on simultaneously, and proceed *pari passu*, and faradic and voltaic irritability are both lessened in proportion to the wasting.

The musculo-spiral nerve is usually the first attacked, the result being a paralysis of the extensors and supinators of the forearm—an affection commonly known as “wrist drop” or “dropped hand.” The affected muscles are wasted and paralysed; the hand hangs from the wrist; the fingers are flexed, and cannot be extended; if placed with the palm downwards on the table, the patient is unable to turn the hand over. It is especially to be noted, however, that the supinator longus—which is also a flexor of the forearm when the elbow is bent to a right angle—and, when the leg is affected, the extensor ossis metacarpi pollicis, usually escape.

It is by no means uncommon to meet with cases in which the paralysis has not advanced to the extent just described, and which are only marked by a certain degree of weakness of the affected muscles.

In the “primary atrophic” form the muscles forming the thenar eminence, the interossei and the lumbricales are especially likely to become involved, and fibrillary tremor may be present, as in progressive muscular atrophy.

Both arms are commonly affected; but the right, probably because it is the one

most employed by a painter in his work, usually suffers most.

Sometimes the muscles about the shoulder are the first to be attacked; the deltoids, the dorso-scapular muscles, and the trapezii then become atrophied and paralysed. The legs may also become affected, the extensor longus digitorum and the peronei, the analogues to the muscles of the arm which chiefly suffer, being most often attacked. The tibialis anticus muscle usually escapes.

In rare cases the affection may be widespread, and involve nearly all the voluntary muscles.

Melancholia, mania and, especially, epileptiform convulsions are prone to occur in advanced degrees of the chronic affection, and such cases may end fatally with delirium and coma.

The *electrical reactions* in the "degenerative" form are those of peripheral neuritis. To faradism the reaction with both nerve and muscle is absent, whilst the galvanic current applied to the muscle gives reactions which are more marked than in health—i.e., the reaction of degeneration is present.

In the "primary atrophic" form the muscles still act to faradism, although the irritability is lowered in proportion to the wasting, the voltaic irritability is lowered in a similar manner, but is sometimes more marked than the faradic, and there may be qualitative change (Gowers).

Circulatory System.—If gout be present as a complication, and it is a very common one, the high arterial tension will necessarily entail a liability to degenerative changes in the myocardium and the walls of the arteries.

Respiratory System.—A marked tendency to attacks of asthma has been observed in the subjects of plumbism.

Urinary Organs.—The liability to gout involves a corresponding proneness to chronic interstitial changes in the kidneys.

Diagnosis.—In doubtful cases, the blue line on the gums is the most important evidence of the presence of lead in the system. The "primary atrophic" form of lead paralysis is often closely simulated by progressive muscular atrophy; but the more common variety—i.e., the degenerative—may be distinguished from progressive muscular atrophy by the absence of the fibrillary tremor of the muscles and by the marked difference in the electrical reactions. In progressive muscular atrophy the galvanic and faradic irritability of the muscles usually diminish as the atrophy progresses, and,

when this is extreme, no reaction may be obtained with either form of stimulation, even with the strongest currents, but these conditions are not invariable. (The electrical reactions in the two forms of lead paralysis have already been described.) Again, in the former disease the muscles are affected according to their physiological grouping; whilst in the latter the paralysis corresponds to the anatomical distribution of the nerves. Lastly, in this form of plumbism the paralysis precedes the atrophy, whereas in progressive muscular atrophy the loss of power is usually in proportion to the wasting of the muscles.

Prognosis.—This is almost invariably favourable in lead colic; but there is a marked liability to subsequent attacks unless the cause be removed.

Cases of lead paralysis of the "degenerative" form and limited to the muscles of the forearms, if submitted to electrical treatment in the early stage of the affection, usually recover completely. If, however, the wasting and degeneration of the muscles have advanced in degree, and the affection be widespread, the loss of power may be permanent, and as already stated, the presence of cerebral symptoms adds greatly to the gravity of the prognosis in such cases.

The course of the primary atrophic form is very chronic, and such cases may never recover completely (Gowers).

Pathology and Morbid Anatomy.—It is now generally recognized that the explanation of the various paralytic affections met with in lead poisoning is chiefly to be sought for in the condition of the peripheral nerves, certainly in the common or "degenerative" form of the affection. The "primary atrophic" form is possibly dependent upon changes in the spinal cord.

On microscopical examination the nerves present the appearances generally met with in peripheral neuritis, for which the article on NEURITIS may be consulted. The degenerative changes sometimes affect the anterior roots of the nerves. The changes in the spinal cord are usually limited to the anterior cornua, the ganglion cells of which have in several cases been found to have undergone atrophy.

The changes observed in the brain in cases marked by cerebral symptoms have not presented any uniformity.

The affected muscles are wasted, brittle and of a pale-yellowish colour. The fibres are narrower than normal, and in advanced stages all traces of muscular tissue may disappear.

Treatment.—Prophylaxis is obviously of the first importance.

As already stated in the section on Acute Poisoning of Lead Workers, the medical examination of persons recently employed in lead works is of the greatest importance. Absolute personal cleanliness, extending to the condition of the finger-nails, the use of a working suit of clothes, a daily warm bath after work, provision for the taking of meals outside the works, and the use of respirators where the air is charged with particles of the metal, are the chief preventive measures which should be enforced in all lead works. It is generally found that the employés endeavour to evade these regulations, and in the best-managed works the enjoyment of certain privileges is restricted to those who rigidly observe them. "Treacle beer" and sulphuric acid lemonade as beverages are of service in preventing the effects of the metal.

Constipation should be relieved by occasional doses of sulphate of magnesia.

Colic is best treated by the application of hot dry fomentations to the abdomen, frequently renewed. The bowels should be cleared by castor oil, with each dose of which from 5 to 10 minims of tincture of opium may be usefully combined, the dose of the latter being in proportion to the severity of the pain. Sulphate of magnesia is also an excellent purgative in such cases, and may be administered, after the more acute symptoms have subsided, in combination with iodide of potassium, the soluble iodide of the metal which results being eliminated by the action of the purgative.

Lead paralysis is best treated by massage to the affected muscles, and the application for about ten minutes daily of the constant current. The treatment should be persevered with for long periods. J. K. FOWLER.

LEPROSY (Lepra).—A chronic, transmissible, specific, bacillary and exclusively human disease, characterized by the formation of neoplasms, which develop in definite elective sites, especially in the skin and certain mucous membranes, in the nerves, in related lymphatic glands and in certain viscera.

When the leprosy formations exclusively or mainly affect the skin, mucous membranes and corresponding lymphatic glands, the disease is spoken of as *cutaneous* or *tuberculated leprosy*; when the neoplasms are localized in the nerves, the terms *nerve*, *non-tuberculated* or *anæsthetic*

leprosy are employed. These two phases are rarely met with in pure forms, and the above terms are usually applied according as the one or the other set of symptoms predominates.

In many cases the two phases are present in fairly equal proportions, or both are well marked, constituting the complete manifestation of the disease process; to this condition the term *mixed leprosy* is applied. Sometimes nerve leprosy follows upon the tuberculated form, and more rarely the latter supervenes on the former.

The term "anæsthetic" leprosy, so frequently used, is not a good one, since more or less anæsthesia is always present in tuberculated leprosy. So also with regard to the name "eruptive, macular or spotted" leprosy; a macular eruption is common to both tuberculated and nerve leprosy, though each phase of the disease has its own pathognomonic macular eruption.

Initial Lesion.—Although observers have described various appearances in sores or wounds or at points of the skin which were supposed to be the sites of inoculation, there is no definite form of *primary* or *initial lesion* known, comparable to that of syphilis.

The exact methods and channels of the introduction of leprosy into the system are to a great extent undetermined.

The *incubation* or *latent period* has remarkable features, and may be very prolonged—up to twelve or twenty years or more. It very commonly lasts from three to six years. The bacillus, even when introduced into the body, appears to remain quiescent until suitable conditions, not at present understood, arise for its germination, and the evolution of the disease is then irregular.

Premising that only a certain proportion of cases of *non-tuberculated* or *nerve* leprosy remain purely such throughout their course, and that in most cases of *tuberculated leprosy* nerve symptoms sooner or later supervene, it is nevertheless convenient to describe the symptoms of each phase separately.

Tuberculated Leprosy.—*Prodromal Stage.*—The most constant premonitory symptoms are dyspeptic troubles, marked drowsiness, lethargy and pyrexia, but such symptoms are too indefinite to be of any value for diagnostic purposes.

The *eruptive stage* is characterized by the evolution of a pathognomonic macular eruption of an erythematous type. The maculæ are rounded or oval in outline, abruptly limited, hyperæsthetic and of

any size from a shilling to a saucer. They are situated most frequently on the cheeks, temples or forehead, where they may excite considerable œdematous swelling, or on the anterior aspect of the forearms or the outside of the thighs (Hillis). The earliest maculæ may disappear and be succeeded for some weeks or months by fresh crops.

On the sites where these maculæ existed or still remain, or elsewhere, tubercles then commence to form. They occur either singly or in groups, and slowly enlarge to the size of a pea or a hen's egg, gradually becoming anæsthetic. They may also coalesce to form more or less extensive areas.

Tubercles may remain practically unchanged for a long time, only deepening notably in colour and acquiring a more or less admixture of a brown tint, or becoming livid or slightly desquamating; or they may resolve, soften and disappear spontaneously, leaving pigment stains. Suppuration or necrosis may occur, and indolent, sharply cut, shallow ulcers form, which discharge a thin pus, and eventually leave, when they heal, more or less anæsthetic scars. This suppuration and ulceration of the tubercles occurs more especially in half-starved and unhealthy subjects, and in the later stages of the disease, when the ulceration may take on a phagædenic character.

Outbursts of such tubercles occur in successive crops at irregular intervals, several times yearly as a rule, but, as Hillis has observed, with diminishing frequency, and after five or six years they cease to occur.

These outbursts are preceded by the *acute* softening of some tubercles, and a systemic infection takes place, characterized by signs quite peculiar to the tuberculated form of leprosy, viz., rigors, swelling and tenderness of the lymphatic glands, symptoms which the lepers regard as their sentinels. The temperature sometimes rises to 105° F., the pulse is quickened, there are subjective skin sensations, with pain, tenderness and swelling of the joints and limbs, tenderness over the liver and spleen, and gastro-intestinal disturbances, such as thirst, vomiting and irregularity of the bowels. The discharges from ulcers dry during this period. In a few days these symptoms subside on the outburst of a crop of tubercles.

Though tubercles may occur anywhere, the sites of predilection for the earlier deposits are the face, forehead, ears and nostrils.

The tuberculated leper presents a

highly characteristic physiognomy, which is first expressionless and aged, and later, from the loss of eyelashes and eyebrows, fierce and staring. Hence arose the old terms satyriasis, leontiasis, and elephanti-
tiasis.

The eyebrows and other parts of the face and ears become greatly thickened, and there is accompanying œdema. The cheeks and chin are pendulous, the nose broadened and depressed, the lips swollen and everted, the ears stuck out, the eyelids ectropic, and the skin generally becomes greasy.

The hair on the face, as on the pubis and elsewhere, falls out only where the neoplasms form, so that the hair on the scalp is preserved. Tubercles form on the back and sides of the fingers and hands, the feet and toes, and extensor aspect of limbs. The extremities become much swollen, more or less livid, the hands spade-like and clumsy, and the legs œdematous and eventually hypertrophic, simulating elephantiasis arabum. The palms and soles are dry, scaly, fissured, but not anæsthetic, and the growth of the nails is interfered with in various directions by the formation of the neoplasm in the bed of, and around, the nail.

The related lymphatic glands enlarge, often to a great extent, and become the seat of leprous neoplasms.

The mucous membranes of the nose, lips, cheeks, tongue, palate, fauces, pharynx and larynx may become studded with tubercles, which may ulcerate.

As the disease progresses the leper acquires a characteristic snuffling, and the voice becomes harsh, toneless, nasal and croaking, and later aphonia may result.

After several years of progress the velum, palate and epiglottis may be destroyed and the cartilages of the larynx involved, leading to dangerous laryngeal stenosis. The destruction of the nasal cartilages causes much deformity. The exposure of the eyeball and the formation of neoplasms in the cornea, sclerotic and iris lead to various lesions of the globe, which often result in loss of sight.

The visceral mucous membranes, with the exception of the rectum and large intestine, are scarcely at all involved, the lesions there giving rise in the later stages to a dangerous form of diarrhœa, simulating dysentery. In all advanced cases of tuberculated leprosy, changes associated with the presence of the bacillus have been found in the larger viscera, such as the lungs, the liver, the spleen

and the bowels, and the testicles. The central nervous system remains intact, or is only rarely involved, and secondarily to the peripheral nervous system.

It is important to notice that when the disease commences before puberty the mental and physical development is retarded, menstruation is long delayed, and the testes atrophy. The testes seem to be peculiarly prone to attack in tuberculated leprosy, even from an early stage of the malady. So the disease, as a rule, progresses, until death ends the scene.

Nerve Leprosy (Anæsthetic Leprosy) is characterized by the progressive formation of the special neoplasm in the peripheral sensory nerves, and to some extent in the motor branches also. The implication of the peripheral nervous system is probably primary.

The Prodromal Stage.—Vague pains, rendered more intense by pressure, are experienced along the course of certain nerves. Feelings of numbness of the extremities, a want of grasping power, tremor and the formation of small and numerous bullæ as distinguished from the large and solitary ones of later stages (Hillis) are symptoms occasionally met with in this stage. For some months these symptoms may be the only evidence of the onset of the disease.

The eruptive stage is characterized by the gradual evolution on the back, shoulders, nates, extremities and the face, of fairly well-defined persistent maculæ, mostly circular in shape, but not raised above the surface. They vary in diameter from $\frac{3}{4}$ inch to 3 inches, and are often symmetrically placed. They do not disappear on pressure.

Nerve leprosy is a very chronic disease, and the macular eruption may remain in this condition for one or two years, and certain cases apparently abort at this early stage. Later, the maculæ begin to spread and tend to coalesce into irregular patches, which, as they enlarge, become *anæsthetic*; the centre pales and the borders may, by comparison, be raised, dark and wrinkled.

Independently of the anæsthesia of the maculæ, large tracts of the surface may also become anæsthetic from implication of the cutaneous nerves.

There will be distinct loss of feeling in the extremities, and the characteristic impairment of nerve influence which is first evidenced in the terminal and pre-terminal segments of the extremities, spreads centrally.

Meanwhile, or from an early stage, tropho-neurotic changes appear in the

extremities, and almost invariably first by a contraction of the little finger.

The subsequent progress of the case is an intensification and wider distribution of these changes. The anæsthetic macular eruption spreads over the body and limbs, and analgesia, more or less deep, sets in. Distinct enlargement may usually be felt along the course of various nerves. Large solitary bullæ form on the extremities, and often leave an ulcer or a white scar. The various tropho-neurotic lesions increase; for instance, a characteristic intractable ulcer appears beneath the foot and at the heel, and the well-known distortions and mutilations proceed in the hands and in the feet. Necrosis and caries of the phalanges and other bones of the hands and feet are not uncommon, gangrene may occur, and in these ways all the fingers and toes may be lost. Later on, various muscular paralyses occur.

There remains only to add that the skin generally becomes atrophied, the glands in the groin sometimes enlarge, and the temperature is much depressed, especially in the advanced stages. The mucous membrane of the mouth and pharynx is rarely, but that of the nose is occasionally, implicated, and absorption of the nasal bones may occur. It is also important to note that the testes do not show the same tendency to be affected as in tuberculated leprosy, but they atrophy if the disease commences before puberty. Nerve leprosy is a much milder and less exhausting affection than tuberculated leprosy; it commences earlier as a rule, and the duration averages fifteen years or more.

Diagnosis.—Animal and vegetable parasitic diseases, elephantiasis arabum, yaws, malarial fevers, syphilis and tuberculosis are frequent complications of leprosy. Experience also shows that it is necessary to insist on the fact that syphilis, tuberculosis and tuberculated leprosy are absolutely distinct affections, and that the one cannot be evolved out of the other. Tuberculated leprosy may easily be confounded with sarcoma of the skin, mycosis fungoides, and especially syphilis, and it should be remembered that the colour of a syphilide is no guide in dark races, and that syphilis, leprosy and tuberculosis alike lead to deformities of the nasal region.

Prognosis.—Although leprosy is not invariably fatal, the disease, in the majority of cases, ends in the death of the subject, either directly during the febrile paroxysms, or indirectly from exhaustion, lardaceous disease or intercurrent affections. Tuberculated leprosy is a far more severe

disease than nerve leprosy, and has a greater tendency to complications.

Pathological Anatomy.—The characteristic new formation met with in the various organs and tissues in leprosy has the ordinary structure of "granulation tissue," consisting of cells separated by a sparse fibrillary framework and freely permeated by blood-vessels. The cells are very persistent, and do not readily tend to undergo changes ending in the ulceration of the neoplasm. The younger ones are mostly rounded, and like lymph-corpuscles. After a time they undergo degenerative changes, and in the process of softening and absorption of the neoplasm the cells vacuolate freely, acquire several nuclei, and tend to enlarge to the extent of four or five times their original volume. Pale granular cells form, and may become irregular in shape. The changes are best seen in the more superficial parts. Finally, they disintegrate and leave deep-brown pigmentation and thickening of the connective tissue, which is probably a result of secondary irritation.

In the peripheral nerves, irregularly distributed, greyish, semi-translucent, fusiform swellings are formed, chiefly where the nerves are most exposed. The new formation is present in the interstitial connective tissue of the nerves, and even beneath the neurilemma and around and between the primitive nerve fibres. If this be absorbed early enough, function may be re-established, but, if not, parenchymatous neuritis and atrophy of nerve fibres result.

The "tubercle" of the skin consists of tracts of granulation tissue extending from the subcutaneous fat to near the rete, following the direction of the framework of the blood and lymph vessels, and especially concentrated around them, and giving rise to secondary irritative or atrophic changes in the papillæ, skin glands, hairs and nerves.

The special bacillus, discovered by Hansen, of Bergen, and first stained by Neisser, of Breslau, is found in great abundance in all the lesions of leprosy.

The bacillus *lepræ* closely resembles in appearance the *B. tuberculosis*, and differs only in some slight details of design, measurement, conduct with colouring reagents, and in the greater numbers present. Unna concludes, from his special method of preparation, that the bacilli lie in the lymphatic system.

Ætiology.—Leprosy is a widespread disease chiefly of hot countries, but occurs under the most diverse conditions of climate, soil, diet, race and unfavour-

able hygienic surroundings. There is no evidence that it arises *de novo*. It is not engendered in the air, soil, water, or in aliments, nor, as far as observation has gone, do any of these ever contain the specific bacillus. All theories to the contrary have been completely demolished by the collection of facts from various parts of the world. The discovery of the bacillus *lepræ*, the analogies of leprosy with the infective granulomata, and the fact that the disease is only propagated by transmission from man to man have caused a general acceptance of the parasitic theory, although the complete chain of proof established by Koch for tuberculosis is as yet wanting in the case of leprosy.

Leprosy has been, and is, most prevalent amongst those races and nations where the freest communication with lepers is allowed by public opinion and law, and has declined coincidently with the moral and material amelioration of the people—i.e., as better hygienic conditions prevailed, and the habits of the population afforded less opportunities for contagion.

The exact method and site of its introduction into the system is unknown, but there is no difficulty in imagining its entrance through the skin or mucous membrane by means of discharges containing bacilli, and coming directly from the neoplasms or from coincident eruptions of the leper's skin, as syphilides, vaccinia, scabies, yaws, &c. There is much evidence produced by Hillebrand, Hillis, Arning, Grainger Stewart and others to show that careless and indiscriminate vaccination may be a medium, and Arning has found the bacillus *lepræ* in the lymph and vaccinal crusts of vaccinated lepers. Possibly the bacillus may also be inhaled. Heredity can only play a small part in the propagation of leprosy, as it acts probably only in the limited sense applicable to syphilis.

As regards sex, males are affected in excess.

Treatment.—At the present time no specific for leprosy has been discovered. A liberal diet, cleanliness, exercise and good hygienic surroundings are essential, and a residence in a healthy, temperate climate is said to retard the course of the disease and mitigate its severity. Tonics are useful at times, and quinine in large doses is serviceable in the febrile attacks. Sulpho-ichthyolate of sodium or ammonium has not met with much favour in England. The Gurjun and Chaulmoogra oils are unquestionably of service. The

latter should be given at first in doses of from 5 to 10 minims in capsules, or in emulsion with milk thrice daily, after a meal, and gradually increased as long as it is tolerated. The drug may be continued over a long period. In a similar manner an emulsion of Gurjun oil, made with an equal part of lime-water, should be persistently given, commencing with 2-drachm doses.

Local Treatment.—Warm baths, plain or medicated, should be systematically used, and the prolonged rubbing in of bland or stimulating oils or liniments containing carbolic acid, salicylic acid, Gurjun or Chaulmoogra oils is very beneficial. Obstinate neoplasms may be dissipated by the application of stronger remedies, such as salicylic acid as a 10 per cent. paste or ointment, or in solution with oleic acid. Unna strongly advocates the use of ichthyol, pyrogallol, chrysarobin and resorcin. The choice and the strength of the application will vary with the site of the neoplasms, the degree of reaction of the skin and the extent implicated. Pyrogallol must be used with caution and to limited surfaces. These substances can be applied as ointments, pigments or plasters. In leprosy surgical operations are constantly required for the removal of disfiguring neoplasms about the face and ears, and especially the eyes, and in various secondary affections of the eyeball; for necrosed bone or cartilage, abscesses, sinuses, or ulcers; for amputations of digits and even greater portions of the extremities; and for the relief of pain and tropho-neurotic deformities by nerve-stretching. The obstinate and extensive ulcerations that so maim and enfeeble the leper should be treated on ordinary surgical principles. Electricity is also of signal service in the tropho-neurotic conditions of nerve leprosy. Lastly, the distressing symptoms in the nose, mouth and throat must be attended to by the daily use of tampon ointments, medicated sprays and steam inhalations, gargles and collunaria, and the constant swallowing of infective material prevented. It must not be forgotten that these discharges from the bowels and from ulcerations, unless properly dealt with, may prove the source of contagion to others. This is not the place to enter into a discussion as to the advisability or practicability of isolating lepers, but it is evident, on the one hand, that a bad case of leprosy in a poor man can only be suitably treated when the patient is under control, and, on the other, that the isola-

tion of a leper under suitable conditions must be for the advantage of the community, though its practicability is another question.

T. COLCOTT FOX.

LEUCIN is one of the products arising from the decomposition of nitrogenous bodies. It may be extracted from almost any of the viscera by the action of caustic alkalies or by boiling with sulphuric acid. It is present in the urine of persons suffering from acute yellow atrophy of the liver, appearing under the microscope as round balls like drops of oil, with or without radiating marks or concentric rings.

LEUCOCYTHÆMIA (*Leukhæmia*; *Leukæmia*).—A comparatively rare disease of the blood, characterized by a disproportionate increase of white corpuscles, differing from leucocytosis in being a permanent and progressive change, and in being associated with a corresponding (but not necessarily proportionate) diminution of red corpuscles.

Leucocythæmia was discovered almost simultaneously in the year 1845 by Hughes Bennett and Virchow. The latter applied to it the term "leukhæmia," or "white blood;" the former first described it as "suppuration of the blood," and subsequently gave it the name leucocythæmia.

The condition is marked by symptoms referable in part to the anæmic state thus induced, and in part to the mechanical effects of the accumulation of leucocytes in the blood-vessels. It is associated in the majority of instances with marked enlargement of the spleen, and, according to many authorities, this splenic variety is the only true form of the affection. But there are cases, as Virchow early pointed out, where the spleen is not enlarged, but where there is a general hyperplasia of lymphatic glands and lymphoid tissue (*leukhæmia lymphatica*). These cases differ from lymphadenoma (Hodgkin's disease) only in the characters of the blood, and hence, according to the view taken of the relation of this to the glandular change, they may be regarded either as cases of Hodgkin's disease with leucocytosis or else as lymphatic leucocythæmia. It is for this reason that the adherents of the latter view style Hodgkin's disease "pseudo-leukhæmia." A third variety was established by Neumann—viz., *leukhæmia myelogenica*—but such cases are often only examples of the splenic variety in which the bone-marrow is secondarily implicated.

Changes in the Blood.—The blood is paler than normal, having when seen in bulk almost the tint of strawberry cream. On microscopical examination it is found to contain a great excess of leucocytes. Instead of the normal proportion to the red of about 1 : 300, there may be as high a proportion as 1 : 20, or even higher, the white corpuscles sometimes actually outnumbering the red. Cavafy and others have observed that most of the leucocytes lose their power of amœboid movement, as if they were no longer living, which suggests an explanation of their retention within the blood-vessels. Further, if, as seems probable, the red corpuscles are derived from leucocytes, the increase in the number of the latter may account for the diminution in that of the former.

The leucocytes vary considerably in size, and these variations have been employed to differentiate the various forms of the disease; for example, a predominance of large cell-forms is said to characterize splenic leukaemia, whilst a preponderance of small (lymphoid) corpuscles is thought to indicate lymphatic leukaemia. An interesting fact is the presence in the blood after death of colourless pointed crystals, which were discovered by Charcot and Robin. Similar bodies were detected by Leyden in the sputa of patients suffering from spasmodic asthma, and they are therefore known as Charcot-Leyden crystals (*see* EXPECTORATION).

Changes in Viscera.—In a vast majority of cases the spleen is enlarged, and with the advance of the disease this organ continues to increase in size, so that at death it may reach downwards as far as the pubes, and to the right considerably beyond the middle line. On section, the organ has a mottled appearance, being paler than natural, whilst there is often no evidence that the Malpighian bodies are more affected than the rest of the splenic pulp. Occasionally, however, these bodies stand out as prominent white nodules. The change appears to be a hypertrophic one, and the sinuses and blood-vessels are filled with leucocytes. Generally there are scattered through the organ numerous hæmorrhagic foci. In advanced stages the spleen becomes firm from fibrous thickening of the trabeculae.

Besides the spleen, the other lymphoid glands in the body may be swollen and hyperplastic, especially the mesenteric and retro-peritoneal glands. The marrow of bones, especially of the sternum, is

in some cases also markedly hyperplastic.

But in spite of the occurrence of cases with but slight splenic affection and predominance of the medullary change, it is questionable whether there is a distinct myelogenic form, some authors attributing the change in this tissue to a secondary rather than a primary process. Indeed, in well-marked cases most of the organs of the body exhibit a leukaemic infiltration. The liver, for instance, may be enormously enlarged by a diffuse infiltration of leucocytes and fibrin between the lobules, and the kidneys may be similarly affected and swollen. Foci resembling infarcts have been found in the lungs.

There may be effusion in the serous sacs.

The *symptoms* of leucocythæmia are in many respects like those of pernicious anæmia, but they are more insidious in their onset. The patient, for some months past, may have been feeling languid, weak and incapable of exertion, with perhaps some shortness of breath. Then there may be pain in the left side, or pain and tenderness over the sternum (in the myelogenic form); or a liability to epistaxis and other hæmorrhages. There may be no pronounced anæmia, and the colour of the skin may become sallow or pigmented. [It is possible that, in some recorded cases of marked cutaneous pigmentation, the coloration may be due to arsenic, which is largely given in leucocythæmia.]

On examination, in the ordinary form the enlarged spleen is readily made out, for it may have attained considerable dimensions before the patient seeks relief. Its enlargement is found to be uniform—projecting below the ribs; and the well-defined notch on the anterior margin, the mobility with the diaphragm, and the continuity of its dulness with that of the normal splenic area enable its true character to be readily determined. Perhaps, also, the liver will be found slightly enlarged. An examination of the blood clinches the diagnosis.

As the case progresses, not only do the liver and spleen continue to enlarge and the relative proportion of leucocytes in the blood to increase, but other symptoms make their appearance. Thus, hæmorrhages may occur beneath the skin, as well as from mucous membranes, and in the retina (leukaemic retinitis). There is pyrexia, either with considerable remissions, or it may present almost an intermittent type. In a well-marked case

observed by the writer fourteen years ago, the patient suffered from rigors and an almost quotidian type of intermittent pyrexia. There is frequently diarrhoea, and maybe vomiting. Together with this there is increasing emaciation, and dropsy may supervene. Well-marked ascites is present in some cases. The urine is usually free from albumen, but is generally loaded with lithates, and often deposits crystals of uric acid. There may be hæmic murmurs at the heart. Pericarditis and pleurisy are not uncommon as complications. The intellect is unaffected, but in some cases cerebral hæmorrhage occurs.

Death is usually due to slow and gradual exhaustion.

The duration of the disease is from one to two or three years.

The *pathology* of the disease is still a matter of dispute. What precise share is taken by the spleen, and to what extent a primary lymphatic or myelogenic leucocythæmia occurs, are points equally unsettled. The theory most tenable at present is that, for some reason or other, the spleen and other hæmopoietic organs fail to convert the leucocytes into red corpuscles. An alternative view is to regard the condition as essentially a disease of the leucocytal elements of the blood, a malignant growth of this fluid tissue, and to refer *all* the visceral changes to the results of this. It has even been suggested to be an infective disease, but as yet bacteriology has made no discoveries in support of such a view.

The *ætiology* is very obscure. It is a disease mostly of adult life, but has been met with in quite young children. It is far more common in males than females. Various causes have been assigned in individual cases, such as over-exertion, exposure to cold and damp, mental worry or emotional disturbance, but obviously these and the like cannot be considered essential. In a certain proportion of cases the disease would seem to have some relation to previous malarial poisoning.

Treatment.—As with pernicious anæmia so here, very little can be done, but the drug on which most reliance is to be placed, and from which the best results have been obtained, is the same in the two diseases, viz., arsenic, administered by the mouth or subcutaneously. Quinine, reputed to have a special action on the leucocytes, may also be given, with or without iron. Iodide of iron has also been prescribed. At one time some rather striking results were recorded of

the effect of phosphorus, but the anticipations raised of its efficacy have not been fulfilled. Transfusion has met with no success. Inhalations of oxygen deserve, perhaps, a more extended trial than has been given them. The use of oxygen in the treatment of this disease was introduced by Kirnberger in 1883, on the theoretical ground that the impaired oxygenation arising from deficiency in red corpuscles led to defective metabolism. He records the successful treatment of a case—a boy, ten years old—with great splenic enlargement and a proportion of w.b.c. to r.b.c. as 1 : 90. Although arsenic was also given in this case, health was not restored until the oxygen inhalations had been fully tried (see *Year Book of Treatment*, 1884, p. 89. For an interesting comparison between the action of arsenic and oxygen in leukhæmia, see *ibid.* 1889, p. 109). Splenectomy has been proposed and actually performed in a few cases, but with almost invariably fatal results (death being due to hæmorrhage). It is difficult to see the rationale of so formidable an operation on any theory of the disease, and its performance should be strenuously discountenanced.

SIDNEY COUPLAND.

LEUCODERMA (Vitiligo; Leucopathia; Leucasmus).—An acquired disease characterized by the appearance of smooth white patches of skin with well-defined borders, more or less symmetrically distributed.

Rounded spots of small size, on a level with the surrounding skin, first appear, most commonly on the trunk, backs of the hands or genitals; these increase peripherally, and coalesce to form variously shaped and often very extensive areas of disease, the boundary line of which is always convex outwards. Around the white patches pigmentation is generally excessive, the line of demarcation being usually abrupt; the healthy skin is thus apt to be mistaken for the seat of disease, and is the main cause of the disfigurement on account of which the patient frequently seeks for advice. If the scalp be affected the hair upon the patch usually becomes white (canities).

The disease is never unilateral, but its symmetry is not usually so perfect as to suggest a primary central nervous affection. Tactile and thermic sensibility, sweat and sebaceous secretion, and all other functions of the affected skin are invariably intact. Neuralgia and pruritus occasionally precede its appearance,

and the writer has observed two cases in which pruritus was a very distressing symptom throughout; one of these subsequently died of acute pemphigus.

Diagnosis.—The condition may be mistaken for partial albinismus, chloasma, morphaea, lepra, for patches of pigment atrophy after the disappearance of macular or papular syphilides, or even for spots of psoriasis blanched by chrysarobin.

The *pathology* of the disorder consists in the absence or diminution of the normal pigment in the mucous layer of the skin; degenerative changes in the corresponding peripheral nerves have been described.

Ætiology.—The disease commonly begins in early adult life, affects chiefly "neurotic" persons and those with dark skins, and is generally progressive, but may become stationary; some authors consider gout a predisposing cause. It may develop after acute diseases, especially the exanthemata, in the course of syphilis and various chronic nervous disorders (tabes dorsalis, alcoholism, neuralgiæ), or may occasionally start from a cicatrix, while it may complicate morphaea, Addison's disease, and area. Leucoderma is common in some districts of India where lepra is prevalent, and may even complicate it; there is, of course, no relation between the two diseases.

Treatment is never of permanent benefit. A temporary return of pigmentation may follow the application of a mustard plaster, but more benefit is usually obtained by the removal of the excessive pigment in the surrounding skin by weak corrosive sublimate lotions or by peroxide of hydrogen.

J. J. PRINGLE.

LEUCORRHŒA (The Whites).—

The popular synonym for leucorrhœa is applied by women to most discharges which are not blood-stained. Before describing the abnormal discharges to which this term is applied it may be useful to draw attention to the normal secretions from the parts concerned. The secretions that normally flow from the female genitals are—(1) Mucus from the Fallopian tubes and the body of the uterus. This is colourless, transparent like white of egg, and does not differ, so far as is known, from mucus in other parts of the body. (2) The secretion of the glands in the cervix uteri. This is clear like white of egg, but rather more tenacious. (3) The secretion from the vagina. In the healthy virgin white flakes are seen lying between the vaginal

rugæ. These flakes are formed by the mingled secretions from the uterus and tubes, cervix and vagina, but what relative amount is furnished by each we do not know. (4) The secretion from mucous follicles situated in the vestibule between the clitoris and meatus urinarius, and also from the glands of Bartholin. These pour out a glutinous mucus having a peculiar odour.

There is also some mucus secreted by the urethra, and there is the secretion from the sudoriparous and sebaceous glands of the skin of the labia. The secretion from the glands about the vulva is often seen inspissated in yellow flakes lying in the furrow between the labia majora and minora, and under the preputium clitoridis.

The mucous secretions, taken as a whole, are scanty in the virgin, more copious in those accustomed to sexual intercourse, still more abundant in those who have had many children, and greatest in quantity during pregnancy. In conditions of debility the discharges are increased. After the climacteric they diminish.

Catarrh of the genital as of any mucous membrane is not uncommon, and often disappears after a few days without any treatment, but in weakly women it is apt to become chronic. Whether this slight leucorrhœa comes from the cervix or vagina we do not know, for, as a rule, neither do medical men propose, nor would patients submit to local examination for so slight an ailment.

Leucorrhœa may be divided into three kinds—vulvar, vaginal, and uterine. Of these, the first is most common in children, the second in young women, the third in elderly women.

A white or yellow discharge *in children* is usually the result of vulvitis. It is important (1) because it may cause, and often has caused, suspicion to be thrown on some one of having communicated gonorrhœa to the child; (2) because the irritation it sets up may lead the child to the practice of masturbation.

It is easily cured by syringing the parts with a saturated solution of borax, at first three or four times a day, then, as it gets better, less frequently. The injection may be given with an ordinary glass male syringe.

The most common cause of leucorrhœa in women *during the child-bearing age* is vaginitis following child-bearing. Next comes cervical endometritis, also a result of child-bearing. These two are often combined. Among other causes which

may lead to leucorrhœa are gonorrhœal vaginitis, and the other rarer forms of vaginitis; venous congestion, the result of heart, lung or liver disease; cancer, fibroids, other new growths from the uterus, and endometritis. Most of these discharges are purulent.

In acute gonorrhœal vaginitis the pus is copious, thick and yellow; in the other more chronic conditions it is thin, watery and less abundant. In mere vaginal catarrh the stains which the discharge leaves are colourless. In cervical endometritis the discharge is thick, and may produce a colourless stain, but as met with clinically it generally either contains pus or is mixed with purulent discharge from the vagina. The leucorrhœal discharge produced by fibroids or endometritis is watery and often tinged with blood. That caused by cancer has in the early stages no peculiar character, but when the cancer begins to break down, the discharge contains fragments of decomposing tissue, and is offensive. But any kind of discharge may cause an offensive smell if the patient neglect cleanliness.

In *old women* who have ceased to menstruate, leucorrhœa may be the result of vaginitis, the discharge being purulent, or of endometritis, the discharge being either watery or purulent.

In *pregnancy* vaginitis and cervical endometritis are frequent, and are especially troublesome to treat.

G. E. HERMAN.

LICHEN.—A generic term now reserved for a well-defined group of inflammatory affections of the skin in which the lesions consist of solid papules throughout the entire course of the disease.

The name was formerly used to designate conditions which are now known to constitute mere phases of other diseases, and much confusion in nomenclature still exists in consequence.

Thus, *L. simplex* and *L. agrius* are now recognized as being the papular stage of eczema; *L. lividus* as severe purpura, in which hæmorrhage occurs into the lesions round the follicles; *L. tropicus* (prickly heat) as constituted by the apparently solid lesions round inflamed sweat glands, and *L. urticatus* by the persistent wheals of chronic urticaria. *L. syphiliticus* is a peculiarly unhappy and misleading designation of the minute papular syphilide. Some doubt still attaches to the true position of *L. circinatus* (vel *circumscriptus*), but the bulk of modern opinion is in favour of

regarding this disease as of sebaceous origin, and its description will be found under the heading of **SEBORRHŒA CORPORIS**.

Lichen ruber is a chronic inflammatory eruption consisting of flat (*L. planus*) or *acuminate*, persistent papules, arranged in groups or lines, or coalescing to form extensive patches.

Lichen planus.—Occasionally, but rarely, the onset of the disease is accompanied by a severe erythematoid outbreak, on the subsidence of which the characteristic lesions may be distinguished. These consist of flat-topped, angular, polyhedral papules, varying in size from a millet-seed to a pea, shiny—especially when viewed by oblique light—and with a central umbilication, when surrounding a sweat duct. Their colour is at first that of the normal skin or a pale pink, but soon they become reddish or purple, and a deep brownish-purple pigmentation is very characteristic and persistent in lesions of old standing, especially when they are situated below the knee and arsenic has been administered freely. The papules are often arranged in lines, bands or groups, suggesting nerve distribution. They do not spread centrifugally like the papulosquames of psoriasis; but extensive plaques or sheets of disease may be built up by the coalescence of numerous papules arising side by side; and over these some thin scale is usually present.

The distribution is almost always bilateral, and usually remarkable symmetry is displayed; the sites of election are the flexor surface of the wrists and forearms, the inner sides of the knees, the legs, ankles and loins; but no region of the body is exempt, except perhaps the face. On the soles and palms the lesions appear as whitish spots scarcely, if at all, elevated. Solid papules are often found on the upper surface of the tongue, generally arranged in two parallel lines along either side of the raphé and on other portions of the buccal mucous membrane, where they resemble the milky-looking patches of syphilis, and are very apt to be macerated and result in troublesome erosions. Much more rarely the glans penis or mucous lining of the vulva is attacked, and in a few cases the lesions of mucous membrane have been known to precede the skin affection by many weeks.

After the subsidence of the papules deep-brown pigmentation and some atrophic pitting are generally left, and the staining is apt to persist for a long time.

In a small proportion of cases the papules and patches become very prominent (*L. hypertrophicus*) and may project from $\frac{1}{4}$ to $\frac{1}{2}$ inch from the surrounding skin, when their surface becomes rough and shaggy—like shagreen—and in such cases the course of recovery is always very tedious.

L. planus is the form usually met with in this country, and is much commoner in women than in men, but there is no line of demarcation to be drawn between it and the next variety.

Lichen acuminatus, the common form on the Continent, assumes a more severe type than *L. planus*, and generally affects men. In many cases acuminate and plane lesions co-exist, the former being on the trunk, the latter on the extremities.

Generally speaking, when the papules are acuminate the disease is very acute and accompanied by grave constitutional symptoms (rigors, pyrexia, sweats, prostration); and itching—usually a troublesome feature of *L. planus*—is intolerably severe.

The constituent papules are minute, firm, conical, capped with scale, very closely aggregated, but can generally be recognized as being around hair follicles. The extent of skin attacked is generally also much greater than in *L. planus*, the whole body surface being frequently involved; deep infiltration and thickening occur, interfering with movements at the joints; the palms and soles become deeply fissured and the nails discoloured, brittle and thinned. Occasionally pityriasis rubra may start from a lichen ruber patch whether plane or acuminate.

In children the disease assumes a somewhat special form; the papules are at first acuminate, but soon become flat and scaly; they develop in groups or circles on either limbs or trunk, and recovery usually occurs spontaneously in a few weeks. In adults, on the other hand, the duration of the disease is indefinite; it is always very chronic, and there is a strong tendency to relapse even after perfect recovery, although not with the same seasonal regularity as in the case of psoriasis.

The *diagnosis* is straightforward in the majority of cases, the characters of the papules being easy of recognition; only when confluent patches are present is diagnosis difficult, and in them outlying papules are always present which exhibit the characteristic appearances. The acute erythematous phase is very rare, and time is necessary to clear up the nature of the case. It is impossible

to enter into the various points of differential diagnosis here; suffice it to say that the distribution, pigmentation, violence of the itching, depth of infiltration with comparatively little scaling, uniformity of type and absence of discharge serve to distinguish it from psoriasis, pityriasis rubra, papular dermatosyphilides and eczema, with which it is most likely to be confounded.

Morbid Anatomy.—There is little that is special in the morbid anatomy, which is that of most chronic dermatites. Copious small-celled infiltration occurs into the superficial layers of the corium; when the process is acute, the rete Malpighii is pushed before the infiltration; when more chronic, the rete cells proliferate, so that the papules are mainly formed by them. There is a special predilection for the lesions to form round the openings of sweat-ducts and hair follicles, surrounding which there is a rich capillary network.

Ætiology.—Little or nothing of a positive nature is known of the ætiology of lichen ruber; it certainly is of common occurrence in persons of neurotic disposition, or in a generally depressed state of health; its subjects are often dyspeptic, and there is good reason to believe that in predisposed subjects a chill may determine an attack. As already mentioned, *L. ruber planus* is commoner in women, *L. ruber acuminatus* in men. Below the age of five years the disease is extremely rare.

Treatment must be both constitutional and local. In acute cases, absolute rest must be enjoined, the food must be nutritious, but easily digestible. Quinine in large doses is very useful, arsenic probably actually harmful. The affected parts may be swathed in rags soaked in lead lotion or calamine liniment, or repeatedly dabbled with lactate of lead lotion (liquor plumbi subac. ʒj ad ʒj of fresh milk). When the acute phase is over, the following lotion may be substituted:—Liq. carbonis deterg. ʒss, glycerini ʒss, liq. plumbi subac. ad Oj.

In chronic cases stimulants, full diet and tonics are indicated, and a change of air and surroundings is often most beneficial. Arsenic is now invaluable, but, to ensure its full effect, must be given in full doses (ʒiv-xv of the liquor thrice daily) with due precautions. Possibly its influence is sooner exerted when given subcutaneously as in Germany, but few English patients will submit to the treatment. In a certain number of cases, in which arsenic is ineffectual, the per-

chloride of mercury appears to be of value.

Locally, the preparations of tar are the most generally valuable; a lotion composed of 1 drachm of liq. carbonis detergens to an ounce or more of water is often useful; or the oil of cade, mixed with oxide of zinc, calamine or subacetate of lead ointments in the strength of 1 drachm to the ounce may be used. Carbolic acid (gr. xx-xxx ad 3j), naphthol or thymol (gr. xx-5j ad 3j), either in lotions or ointments, are also much employed. Prolonged alkaline baths relieve itching perhaps better than anything else, and form a suitable prelude to the use of ointments or lotions.

Lichen scrofulosus (vel scrofulosorum) is not so rare a disease as is usually asserted, but its existence is often ignored, as the eruption is in itself inconspicuous and gives rise to no subjective symptoms; when noticed, its true character is seldom recognized, as Hebra's original description of an exceptionally severe form is still almost universally accepted as that typical of the disease.

Children are, in the great preponderance of cases, its subjects, and in almost all there is a phthisical family history, a strumous physiognomy or physical evidence of tubercular disease of lungs, lymphatic glands or bones.

The eruption is situated on the trunk, especially upon the back, either diffusely or in patches; when diffuse and abundant, the arrangement of the component papules is indiscriminate; when patchy, there is a great tendency to the formation of rings. In either case the papules are very small, pale, conical and surmounted by fine scale; they cause no itching, and, after their subsidence, leave rather persistent yellowish pigmentation. After disappearing from one situation they are apt to crop up in another, and so successively to invade the whole trunk.

In adults the disease is much rarer, but Hebra's description is based upon a study of such cases; the same association with tubercular taint obtains as in children, but the lesions are much less abundant, the papules larger, brighter in colour, more discrete, and with more marked tendency to ringed arrangement.

In children the *differential diagnosis* must be established from papular eczema, and in adults from circinate papular dermatosyphilis, which sometimes closely resembles it.

Pathologically the disease consists of moderate small-celled infiltration into

the upper layers of the corium, especially around sebaceous glands and hair follicles; tubercle bacilli have not been demonstrated.

The *treatment* is mainly that of tubercular affections, prominent among remedies being cod-liver oil; arsenic and the iodides are useful adjuncts. Externally the inunction of vaseline or lanolin probably hastens the disappearance of the rash.

Lichen pilaris (L. spinosus), a rather rare and ill-defined disease, in which inflammatory papules are formed around the hair follicles, the centre of which is occupied by a spiny plug of epidermis. It has affinities on the one hand with so-called keratosis pilaris (vel ichthyosis follicularis), which is, however, a congenital and non-inflammatory affection, and on the other with simple folliculitis—follicular eczema—and with psoriasis pilaris.

It occurs both in children and adults, but especially in early adult life. Very recently Darier has demonstrated the presence of psorospermia in the disease, and they are most probably its immediate cause. Positive evidence in the form of successful inoculation experiments is still, however, wanting (*see PSOROSPERMIA*).

The papules are very prominent, taper to a fine point, and contain a central spine, which, when extracted, leaves a deep pit; at first they are bright red, but afterwards become much paler. They appear suddenly in circular patches, especially about the back of the neck and shoulders, but also on the buttocks, over the trochanters and on the abdomen; they cause a rough nutmeg-grater-like feeling to the touch, as well as some inconvenience to the patient from catching on the underclothing. The amount of itching varies considerably in different cases. - After subsidence some pigmentation is left, and the eruption has a tendency to recur.

The *treatment* consists in the mechanical removal of the plugs by vigorous friction with soft soap, after hot alkaline baths, and the subsequent inunction of some weak tarry ointment—e.g., ol. cadini 5j ad 5j. Internally, cod-liver oil may be used.

J. J. PRINGLE.

LIVER, ABSCESS OF (Hepatic Abscess).—Abscess of the liver is rarely caused by *mechanical injury*, rarely also from irritation set up through *obstruction* of bile passages or *ulceration* of their walls due to calculi or round-worms. A

hydatid cyst may suppurate, and then form an abscess. *Pyæmic* or *metastatic* abscesses occur in connection with surgical suppurations, ulcerative endocarditis, and gangrene of the lung, but the chief cause of abscess of the liver is *ulceration* or *suppuration* occurring in the *area of the portal circulation*.

Among the rarer conditions of this class that have been known to give rise to it are phlegmonous gastritis, ulcer and cancer of the stomach, enteric fever, catarrhal ulceration of the intestine, ulcers of the cæcum and vermiform appendix, pelvic abscesses connected with the uterus or its appendages, and purulent peritonitis.

But by far the most common cause is *dysenteric ulceration* of the large intestine. It is doubtful whether *tropical* abscess ever occurs apart from dysenteric ulceration, but some authorities are of this opinion.

Symptoms.—In the great majority of the secondary forms there are no special symptoms produced by the supervention of this condition; what symptoms there are are constitutional, and are masked by those of the grave disease in the course of which it has occurred.

In tropical abscess there may be no symptoms, several sudden deaths having occurred from rupture of an abscess into one of the neighbouring serous cavities in persons supposed to be in good health. But the most usual symptoms are local pain, feverish attacks resembling ague and often mistaken for that disease, with the appearance of a fluctuating tumour or evidence of enlargement of the liver, and jaundice. If the abscess reaches the peritoneal surface of the liver, it causes local peritonitis. There may be pain at the tip of the right shoulder, furred tongue, gastric catarrh, loss of appetite, wasting, and profuse sweating. The *termination* of such an abscess is by pointing and opening externally or into some neighbouring cavity. The most favourable mode of evacuation next to external pointing is into the colon, but it may open into the pleura, the lung, the stomach, the duodenum, the pericardium, the pelvis of the right kidney, or the peritoneal cavity.

Diagnosis.—When there is a fluctuating tumour the presence of suppuration may be suspected, but is only rendered certain when the swelling is proved to contain pus by puncture with a fine needle. When residence in a tropical climate is followed by local pain, rigors and enlargement of the liver, it is probable that

there is an abscess, but in this case its seat may be difficult to recognize, and the diagnosis is hardly established until, by perhaps repeated punctures with a long fine aspirator needle, the abscess is hit and pus is drawn off.

Morbid Anatomy.—The anatomical appearances vary in the different ætiological forms. In connection with disease of the bile ducts, the abscesses are multiple, and are formed by the suppuration of cavities consisting of dilated and sacculated ducts. In pyæmia and other metastases, abscesses are also multiple, usually of small size, and rounded in shape; the walls of such abscesses are formed of infiltrated and softened liver tissue. In the tropical variety the abscess is generally large, single, and the wall is more organized.

The modern *treatment* of hepatic abscess is exclusively surgical. Wherever it is possible the cavity should be opened, its edges stitched to the abdominal wound, and drained. All other measures are useless.

ROBERT SAUNDY.

LIVER, ALBUMINOID DISEASE OF.—*Symptoms*.—There is *enlargement* of the liver, the organ often

attaining a great size, with a very well-defined edge, easily palpated. There is, as a rule, no ascites, but in the later stages there may be cedema of the lower extremities. The spleen is also enlarged. In many cases the degeneration is not advanced far enough to give rise to distinct enlargement of the liver, and the diagnosis is only made on the post-mortem table. Its existence may often be inferred from the presence of favourable ætiological conditions; but it is a noteworthy fact that, in Birmingham, waxy degeneration occurs with much less frequency in connection with chronic suppurations than it does in London and Edinburgh.

Morbid Anatomy.—The liver is enlarged, smooth and hardened. Its edge is sharp, the normal shape is retained. Its colour is rather pale. On section, it is firm to the knife, like bacon, and on pouring over it a weak solution of liq. iodi (1 part of liq. iodi to 10 of water) a mahogany-brown stain appears; sometimes this reaction can only be obtained by soaking thin sections in the fluid, and examining with the microscope, and this even in organs whose naked-eye appearances leave little doubt as to the nature of the change. Under the microscope, the affected parts are stained rose-violet with methyl-violet while the healthy tissue

is coloured blue-violet. The degeneration commences in the middle zone of the lobules, and attacks the capillaries of the hepatic artery, causing these to swell and compress the cells, which undergo atrophy.

Ætiology.—The various causes of this condition will be found under **ALBUMINOID DISEASE** (*q.v.*).

Treatment.—The removal of the cause is the only measure which is known to have any influence upon this condition. The malarial taint may be treated by quinine and arsenic; syphilis, by mercury and iodide of potassium; phthisis, by quinine and cod-liver oil. Surgical conditions should receive proper local attention, and the presence of evidences of waxy degeneration should not be allowed to bar an operation if it be possible by this means to get rid of the cause. Cases are recorded in which, after removal of a source of suppuration, the liver, although previously much enlarged and extending downwards below the umbilicus, resumed its normal size.

ROBERT SAUNDBY.

LIVER, ACUTE YELLOW ATROPHY OF (Icterus Gravis).—A very rare disease of the liver, characterized clinically by the presence of jaundice, and pathologically by a rapid wasting of the liver. It occurs either as a primary affection or as secondary to chronic hepatic disease.

Symptoms.—In the beginning these cases resemble simple catarrhal jaundice, and in many there is some gastro-duodenal catarrh. But cerebral symptoms soon manifest themselves; headache sets in, followed by delirium, which often amounts to maniacal excitement; later on the patient becomes comatose, and convulsions are common, especially in young subjects. Hæmorrhages may take place from all the mucous surfaces, hæmatemesis being the most common. The temperature is at first sub-normal, normal or slightly raised, and this may persist until the end, but in a considerable proportion of cases during the last hours of life the temperature rises considerably.

The urine is small in amount, of high sp. gr., loaded with bile pigment, and contains very little urea, with much leucin and tyrosin, and is oftentimes albuminous. The jaundice is intense.

Pain in the region of the liver is sometimes complained of, but the area of liver dullness is always reduced or entirely absent. This sign is favoured by the tympanitic distension of the intestines.

The *diagnosis* of the condition may be impossible before the occurrence of cerebral symptoms, but the supervention of acute jaundice in pregnant or puerperal women, or the subjects of cirrhotic liver, should be regarded with watchful misgiving. Later on the disappearance of the liver dullness, and the presence of leucin and tyrosin in the urine, will confirm a diagnosis which the occurrence of the severe cerebral symptoms has suggested.

The *duration* of the disease varies very greatly, from twenty-four hours (?) to two months, but most cases terminate between the fifth and the fourteenth days.

The *prognosis* is said to be not absolutely hopeless; though it is not easy to understand how recovery can take place from an anatomical condition such as we find post mortem, nevertheless a certain number of alleged recoveries have been recorded. Yet the prognosis must be most grave.

Morbid Anatomy.—The liver is much reduced in weight, weighing from 20 to 30 oz. in adults; it is flattened, of very soft consistence, while its capsule is shrunken and wrinkled. The external bile apparatus is generally empty. In the *primary* form, on section, the liver is uniformly yellow, and no definite structure can be recognized. Under the microscope all that can be seen is a mass of granules of fat, bile pigment, blood pigment, and leucin and tyrosin crystals. The liver cells have disappeared. In the *secondary* form the process is commonly partial only; some areas of the liver are bright yellow, while others are bright red, and others again are unaffected by any acute degeneration. Under the microscope the yellow areas are much the same as in the first form, but the red areas show acute infiltration of round cells in the interlobular fissures and spaces. Cornil described a great multiplication of biliary canaliculi in cirrhotic livers undergoing this change, but the process is so common in cirrhosis that it cannot be regarded as specially connected with this degeneration. The liver cells show various stages of acute fatty degeneration, bile and blood-pigment granules and leucin and tyrosin crystals are present. The nature of the pathological process in the yellow form is a most intense acute parenchymatous inflammation; in the red form this is less intense, and is accompanied by interstitial inflammation. A similar parenchymatous inflammation affects the muscular wall of the heart and the parenchyma of the kidneys.

The disease is undoubtedly due to a toxæmia, the nature of which is not known. The best explanation of the jaundice in this disease is that it is due to the absorption of bile secreted in the early stages of the disease, but which is hindered from escaping by the ordinary channels on account of the plugging of the smallest bile ducts by plugs of desquamated and degenerated epithelium (Buhl); but this is not altogether satisfactory.

Etiology.—The influence of previous attacks of jaundice, of syphilis and of alcohol is questionable, except in so far as either may have led to cirrhosis of the liver, for it is especially as a mode of termination of cirrhotic liver that the secondary form occurs.

The primary affection is especially associated with pregnancy and the puerperal state, but the nature of this relation is not understood.

Cases have been observed to occur in enteric fever (Frerichs) and in pneumonia (Liebermeister).

The influence of age is observed in both sexes, it being rare before fifteen and after forty years in both men and women, but females are twice as liable to the disease as males.

In acute phosphorus poisoning the liver may present quite identical appearances to those seen in this disease.

No treatment would seem to be of much use, but, in some of the cases which have recovered, mild purgatives of calomel, jalap, &c., were used, in another aconite, and in still another benzoic acid with musk in large doses.

ROBERT SAUNDBY.

LIVER, CANCER OF.—Cancer of the liver is generally secondary to cancer elsewhere, the primary disease being most commonly situated in the stomach, but primary cancer of the liver is not rare.

Of primary cancers quite a considerable proportion begin in the bile ducts, and the disease is so often associated with gall-stones that the irritation of these has been justly regarded as a cause. In other cases the cancer appears to commence in the liver tissue itself. Like cancer generally, it is rare before middle life, but affects both sexes, though it is more common in women.

Symptoms.—Secondary cancer of the liver often runs a latent course, and is only recognized on the post-mortem table.

In a typical case of cancer of the liver the patient suffers from gradual im-

pairment of health and strength, loss of appetite, gradual appearance of cachexia, wasting and indications of chronic gastro-intestinal catarrh. Ascites and œdema of the legs supervene; jaundice is commonly present, and there may be pain over the liver.

On examination the organ is found to be enlarged, and is often tender; in the nodular form irregularities of the surface may be perceived on palpation. There is necessarily considerable variation in the symptoms, and the *diagnosis* is often beset with difficulty, especially when a primary cancer of the stomach has become adherent to the left lobe of the liver. Perhaps the most important symptom of cancer is an excessive loss of body weight.

The *duration* of the disease is usually from four to five months, but some cases far exceed this limit.

The *prognosis* is necessarily of the worst kind.

Morbid Anatomy.—The cancerous liver is almost invariably greatly enlarged, while the new growth appears under four different forms.

(1) The commonest form is as large, white, hard nodes, which, where they are visible on the surface of the organ, are distinctly umbilicated, and on section their cut surface becomes concave; less commonly the masses are softer. They are sharply marked off from the liver tissue, and their centres are usually undergoing fatty necrosis. Under the microscope they present the usual characters of cancer—epithelial cells lying in an alveolar stroma.

(2) There is diffuse cancerous infiltration of the liver, with much thickening of its capsule and connective tissue.

(3) The liver is beset with small nodules, varying in size from a pin's head to a walnut, which appear to grow in the interlobular connective tissue.

(4) When the primary disease is in the region of the gall-bladder an enormous mass of new growth may be present in the situation with secondary nodules elsewhere in the liver.

Treatment can be only palliative.

The pain can be relieved by morphine hypodermically; if the itching of the skin be very troublesome, sponging with vinegar and water, or pilocarpin (gr. $\frac{1}{2}$) hypodermically may be tried, but these remedies are uncertain. If the ascites be very great it may be quite worth while to draw some of it off by a trocar to relieve the pressure on the diaphragm.

ROBERT SAUNDBY.

LIVER, CIRRHOSIS OF (Interstitial Hepatitis) (κίρρως, yellow).—This disease, or group of diseases, is essentially characterized by the formation of fibrous tissue in the liver, with consecutive atrophy or destruction of the glandular elements.

The following varieties may be distinguished:—

1. Alcoholic cirrhosis.
2. Cardiac or Cyanotic cirrhosis.
3. Biliary cirrhosis.
4. Syphilitic cirrhosis.
5. Tubercular cirrhosis.
6. Malarial cirrhosis.
7. Scarlatinal cirrhosis.
8. Rachitic cirrhosis.

1. Alcoholic cirrhosis is the common form ("hobnail" or "gin-drinker's" liver). The organ is generally small, hard and granular. The disease is frequently met with clinically in association with ascites. It is undoubtedly caused by the abuse of alcohol.

Symptoms.—The ordinary rule is for the cases to come under observation with more or less ascites, associated with various dyspeptic phenomena due to the gastric catarrh, such as morning sickness, loss of appetite, water brash, sour risings, and, later, hæmatemesis.

There is often great flatulence; the skin may have a sub-icteric tinge, and occasionally, though rarely, there is actually jaundice, probably by extension of catarrh from the duodenum to the bile ducts. The urine is generally scanty, high coloured, containing so-called febrile *urobilin*, and loaded with lithates; it often contains a little albumen. Enlargement of the spleen can generally be made out.

On percussion, the liver dulness is notably diminished, especially in the epigastrium, but even in the right vertical mammary line the area of dulness is reduced from $4\frac{1}{2}$ to 2 or $1\frac{1}{2}$ inches, or even less when there is much flatulent distension. Not uncommonly, however, ascites is absent; this occurred, according to Frerichs, in about one-third of his cases; but when there is no ascites it usually happens that the case does not come under medical care until some serious and often fatal accident, such as hæmatemesis or the supervention of acute atrophy (see ACUTE ATROPHY), has taken place.

It is quite possible for this form of cirrhosis to go through its entire evolution without producing any marked disturbance of health. Some years ago the writer examined the body of a foreman

engineer at a colliery, who had died suddenly of hæmatemesis. Although a hard drinker, he was a valued servant and a steady workman, not having lost a day's work for the previous two years. His liver was a most typical example of small "hobnail" cirrhosis, and he died, as these cases often do, from the rupture of a varicose œsophageal vein.

The explanation of the absence of ascites is probably to be found in the venous enlargement taking place more readily and completely in certain cases. But it is not very uncommon to find well-marked chronic peritonitis associated with cirrhosis of the liver, and it is possible that slight degrees of peritoneal inflammation may play a more important part in the production of the ascites of this disease than the prevalent mechanical theory would indicate.

Course and Duration.—The disease is essentially chronic, and usually must have existed for a period of from one to two years before it comes under observation in its developed form. Even after that, such cases may go on for years, but, as a rule, the patients do not give up their drinking habits, and in that case recovery is hopeless.

Morbid Anatomy.—The liver varies in size, but is ordinarily reduced in volume; when it is larger than normal there is usually marked fatty infiltration as well. The atrophy especially affects the right lobe, but there is a general reduction in every diameter. The colour is usually a pale olive-brown. The surface is extremely granular, and the capsule thickened and opaque. The external biliary apparatus contains very little bile.

On section, the organ is very tough, and the cut surface shows bands of fibrous tissue traversing the organ in all directions and encircling groups of acini, which are often stained yellow; hence the name cirrhosis.

Under the microscope the new formation is seen to grow from the pre-existing connective tissue in the portal canals and interlobular fissures and spaces. The branches of the portal vein in the portal canals are dilated and thickened. The branches of the hepatic artery are also thickened, while there is frequently an abundant new formation of capillary bile ducts around the margins of the affected acini. The acini are slowly invaded from their periphery by the encircling growth, their rows of cells undergoing retrogressive changes, losing their protoplasm, and apparently becoming in some places converted into cubical

epithelium which lines the newly formed ducts; in other places they disappear by direct transformation into connective tissue. The hepatic cells can be seen to be enlarged, and their nuclei have divided and proliferated to form groups of round cells, out of which connective tissue is formed (Hamilton).

Ascites is frequently present. There is often great dilatation of the sub-diaphragmatic, gastric, and œsophageal veins, which may be as large as the femoral or iliac veins. The spleen is generally much swollen. The kidneys usually present some degree of chronic inflammatory induration. The mucous membrane of the stomach shows an advanced stage of chronic catarrh, being greyish coloured, covered with thin mucus and mammillated (*état mamelonné*).

Treatment.—The patient should become a total abstainer, and his diet should consist of light meats, fish, fowl, eggs, milk, cream, bread, butter, small quantities of well-cooked vegetables, and some alkaline mineral water or aerated distilled water. The ascites should be tapped and drawn off as often as it re-accumulates. If this be persevered in, the fluid will eventually, in many cases, cease to be poured out, to the patient's great comfort and satisfaction.

If tapping be absolutely objected to, the fluid may be got rid of by purging with bitartrate of potash—*R* Potassii bitartratis \mathfrak{zss} , mellis \mathfrak{zj} ; sig. This may be given as often as required to keep up free purgation—but its use is not unattended with danger, and is not to be recommended in place of tapping. The effect of the cessation of the effusion is to bring the patient into a condition like that of his fellow-sufferers who do not acquire ascites. He is still liable to death from hæmatemesis, due possibly to rupture of a distended œsophageal vein.

2. Cardiac or cyanotic cirrhosis has been described as a consequence of prolonged venous hyperæmia (see LIVER, HYPERÆMIA OF), depending upon pulmonary or cardiac disease.

The liver is at first enlarged, but may atrophy; it is usually hard, with a thickened capsule, and is of a dark colour. The liver cells around the radicles of the hepatic vein in the centres of the acini become destroyed, and are partly replaced by fibrous tissue, mingled with granules of blood and bile pigment. There is often slight jaundice, the liver is tender; the peritoneum contains fluid.

The diagnosis rests upon the recognition of the disease in the thoracic organs.

The treatment must be directed to the cause of the obstruction.

3. Biliary cirrhosis is best seen in cases where there is some permanent or protracted occlusion of the common duct, as by a calculus.

Early jaundice is a leading feature in the clinical history.

The liver is generally enlarged, but may undergo atrophy; its surface is tolerably smooth, its tissue deeply bile-stained and traversed by fibrous trabeculae. Charcot has pointed out that the bands of fibrous tissue embrace single acini (monolobular) instead of groups of acini, as in alcoholic cirrhosis (polylobular). The increase of capillary bile ducts is often very well marked, but not so as to constitute a distinctive feature, as has been asserted (Charcot). Ascites is generally absent.

The course of these cases is chronic, but they are very unfavourable. They terminate sometimes with partial acute atrophy, and often with so-called uræmic (? cholæmic) symptoms—*e.g.*, muttering delirium, dry tongue, and stupor.

The treatment can only be palliative. The diet should consist of light animal and farinaceous food, with no uncooked fruit or vegetables, no pickles, condiments, or strong wines or spirits. Some alkaline water (Kronenquelle or Vichy) should be taken twice a day with lemon-juice or claret. The bowels should be kept open by saline purgatives—Carlsbad salts, Hunyadi water, or Friedrichshall—and if there be any gastric irritability, bismuth (gr. x) should be given before food.

4. Syphilitic cirrhosis.—The disease which most truly deserves this name is only seen in congenital syphilis in children.

Symptoms.—The child usually presents other signs of congenital syphilis—*e.g.*, depressed nasal bones, atrophied incisor teeth, a yellow cachectic skin. The enlargement of the liver is the only local sign of the affection.

Morbid Anatomy.—The liver is enlarged, the capsule opaque, and the surface smooth. On section, it is tough, and in parts the liver tissue has undergone complete fibroid transformation. Under the microscope the growth is seen to invade the lobules, destroying them cell by cell; hence Charcot's designation, "monocellular cirrhosis." In adults, cirrhosis may be combined with gummatous deposit. In the latter case waxy degeneration may also be present. The spleen is always enlarged.

Treatment.—Small doses of mercury, gr. $\frac{1}{2}$ thrice daily, with syrup of the iodide of iron and cod-liver oil, good food and fresh air afford the best chance of arresting the disease and eradicating the constitutional malady.

In **gummatous cirrhosis** the *symptoms* are usually obscure unless the cirrhosis be very well marked. The cases are commonly regarded as examples of alcoholic cirrhosis as the external manifestations of syphilis are often but slight when the effects of the poison on internal organs are very marked. It may give rise to jaundice or ascites or to hæmatemesis. The liver may be enlarged or atrophied or irregular in shape owing to the cicatricial contraction of old gummata.

In many cases the *diagnosis* is only made on the post-mortem table.

The *treatment*, when the nature of the disease is recognized, should be that of constitutional syphilis. Iodide of potassium in full doses, ʒss three times a day, with ʒj doses of liq. hydrargyri perchloridi, or, better, small doses of calomel gr. $\frac{1}{2}$ thrice daily.

5. **Tubercular cirrhosis** occurs in phthisical patients without producing any symptoms.

The liver is enlarged, smooth and of normal consistence; on section, its surface shows a meshwork of fibrous bands running between the lobules, and there is a very great development of capillary bile ducts in the newly formed connective tissue around the lobules.

It is doubtful if it could be diagnosed during life, as enlargement of the liver in phthisis commonly occurs from venous congestion or fatty infiltration or waxy degeneration. It is a very rare disease.

It is probable that the cirrhotic livers described in connection with certain cases of tubercular peritonitis belong to this class.

6. **Malarial cirrhosis.**—The indurated and pigmented liver met with in the subjects of chronic malarial poisoning.

The *symptoms* are indefinite; jaundice is often present, and there is frequently a sense of weight in the hypochondrium, while, on examination, the liver is found to be enlarged. It is usually associated with chronic gastric catarrh. The spleen is also enlarged.

The organ is usually large and dark, tough on section, and under the microscope the new growth is seen in the portal canals, fissures and spaces of the liver, from whence it penetrates the

lobules (Hayem). The connective tissue is loaded with pigment.

The *treatment* consists in the administration of a course of arsenic in small doses combined with nitrohydrochloric acid and a bitter infusion, and the use of mercurial purgatives and saline or alkaline mineral waters—e.g., Carlsbad or Vichy.

7. **Scarlatinal cirrhosis** is a possible explanation of certain examples of cirrhotic liver met with in young children. An interstitial hepatitis seems very commonly to form part of the morbid anatomy of scarlatina, but it is a microscopical fact without any clinical features that are known.

8. **Rachitic cirrhosis** has been recently described as occurring in young children. A very important point in its aetiology is chronic gastro-intestinal catarrh, from which these children have generally suffered.

The *symptoms* are chiefly those of chronic or intermittent gastro-intestinal catarrh, constipation alternating with attacks of diarrhoea. The child's appearance is cachectic and it has a strong superficial resemblance to a case of congenital syphilis, but there is an absence of specific signs and history. In the opinion of the writer, there is no doubt that the two conditions are not identical.

Morbid Anatomy.—The liver is enlarged, smooth, and of normal colour or pale from fatty infiltration. On section it is tough, and on microscopical examination there is an increase of connective tissue in the interlobular fissures and spaces, assuming a "monolobular" distribution, and accompanied by a considerable new formation of biliary canaliculi. The spleen is also enlarged.

The *treatment* which succeeds best is calomel in small doses, from gr. $\frac{1}{2}$ to $\frac{1}{3}$ three times a day, with syrup of the iodide of iron and cod-liver oil, fresh air and good food. Care should be taken to exclude from the diet uncooked fruit and vegetables, and even cooked vegetables which contain much vegetable fibre—e.g., carrots, parsnips, stewed celery, onions. In obstinate cases all vegetable, starchy and saccharine articles of diet must be forbidden.

ROBERT SAUNDBY.

LIVER, HYPERÆMIA OF.—*Symptoms.*—In *mechanical congestion* the main symptom is increased size of the percussion area of the liver, with perhaps a palpable displacement downwards of its anterior border.

In *active congestion* there is often more pain in the right hypochondrium, or at least a sense of weight and fullness there. Jaundice, gastric disturbance, mental depression and ascites may be present.

The urine is generally diminished in amount and loaded with lithates; it often contains albumen, and sometimes bile pigment or febrile urobilin.

Course and Duration.—This will depend upon the causation. When of a temporary nature the liver recovers with the cessation of the cause, but when it is permanent no improvement can be looked for. In congestion from chill recovery is usually rapid and complete, though there is a liability to recurrence.

Diagnosis.—Little need be added on the subject of diagnosis, except that it is necessary to exclude the various organic diseases, which can only be done by a knowledge of their symptoms and relationships.

Morbid Anatomy.—In *mechanical congestion* due to obstruction of the circulation the liver is, at least at first, enlarged and soft, but after a time it becomes reduced in size, of firm consistence and darkened from the deposit of pigment. The central veins of the acini are dilated, and the surrounding cells are more or less destroyed. This is the condition called *cyanotic induration* of the liver. In many cases there is an accumulation of fat in the portal zones of the acini, giving rise to a peculiar mottled appearance called the *nutmeg liver*. There is some increase of connective tissue, the capsule of the liver is thickened, and the surface is more or less finely granular.

In *active hyperæmia* the liver is dark red, soft and vascular.

Etiology.—Mechanical congestion may result from heart or lung disease, pleural effusion, intra-thoracic tumours, or tumours compressing the vena cava just after its junction with the hepatic vein.

Congestion may also result from high living, sedentary habits and abuse of certain articles of diet, especially alcohol.

Chill seems to be a not uncommon cause of active congestion of the liver in predisposed subjects.

There are other conditions which may give rise to hyperæmia of the liver, but they are of minor importance from a clinical point of view.

Treatment.—In all *mechanical congestions* this must take the form of attempting, so far as is possible, to remove the cause. The hyperæmia may be relieved by saline

purgatives, by euonymin, calomel and other cholagogues.

Acute hyperæmia from chill should be treated by hot fomentations and large doses of calomel (5 to 10 grains).

The diet should be as simple as possible, and all substances tending to cause hyperæmia should be avoided—*e.g.*, alcohol, butcher's meat, sugar.

The following pill is a useful one:—

R Euonymini gr. j, extr. aloes gr. ij, extr. belladonnæ gr. ʒ; ft. pil.; sig. One to be taken half an hour before the principal meal of the day. It is especially useful in obesity with hepatic congestion.

ROBERT SAUNDBY.

LIVER, HYDATID OF—For an account of the life-history of the *tænia echinococcus* the reader is referred to the article on HYDATID DISEASE.

Symptoms.—A hydatid tumour produces effects varying with its size and situation in the liver. It may cause displacement of other organs, compression and obstruction of the bile passages and portal vein, leading to jaundice or ascites. It may rupture into the pleura or lung, discharging its contents through the bronchi; or into the bile passages, through the common duct, causing jaundice and pain and simulating the passage of gall-stones. It may rupture into the inferior vena cava or hepatic vein, causing death by embolism of the hepatic artery, or into the abdominal cavity, causing peritonitis.

The *diagnosis* is often difficult, and may be impossible. A slowly growing tumour of the liver unattended by grave constitutional symptoms, especially if it give evidence of fluctuation, is probably an "hydatid." An exploratory puncture with a fine needle will afford positive information if the cyst be not inflamed. Hydatid fluid is clear, free from albumen, of low sp. gr. (1007 to 1015) and contains a large amount of chloride of sodium. It may contain sugar.

Under the microscope, hooklets or even tapeworm heads may be found in the sediment, or pieces of hydatid membrane may be obtained. The latter are recognizable by their characteristic serrated lamination. When the cyst is inflamed, puncture is not so valuable, but hooklets may be found in the pus under the microscope; in this case differential diagnosis is not so important, as operative interference should be undertaken in any case. Multilocular cysts are said to be always accompanied by swelling of the spleen.

The *prognosis* in cases of simple cyst

is good; and of recent years liver surgery has advanced so far that even in suppurating or multilocular cysts a cure may be hoped for.

Treatment.—Simple cysts can be usually cured by merely *withdrawing the fluid by a fine needle or aspirator*. Injection with iodine has been performed, but is not recommended. Electrolysis is not free from danger. Suppurating and multilocular cysts should be treated by free incision, the edges of the cyst being stitched to the abdominal wall and the cavity drained. ROBERT SAUNDBY.

LIVER, PARASITES OF.—The following parasites occasionally localize themselves in the liver:—*Tænia echinococcus*, *distoma hepaticum*, *distoma lanceolatum*, *distoma hæmatobium*, *pentastoma denticulatum*, *psorospermia*, and *cysticercus cellulosa*. Of these the *echinococcus* is the only one which ordinarily gives rise to symptoms (see LIVER, HYDATID OF).

Psorosperms are very rare in man, but are common in the livers of rabbits. They are said to be *gregarina* at rest (*Eimer*). They form small white cysts containing a milky fluid, in which, besides epithelial cells and pus-corpuscles, *psorosperms* can be seen under the microscope (see PSOROSPERMIA).

The *pentastoma denticulatum* is the embryo of the *pentastoma tænioides*, which haunts the nasal cavity of the dog. It has been found chiefly in Egypt, but also in Germany (*Zenker*). It occurs in the liver in the form of rounded nodules, the size of a pin's head, which are composed of a connective-tissue capsule, enclosing the parasite, which is generally infiltrated with salts of lime. If these are dissolved by acids the feet and skin of the parasite can be recognized. The latter is studded with fine thorns alternating with rows of double-contoured stigmata (*Heller*). When a large number of these parasites invade the liver at one time they give rise to grave constitutional disturbances.

ROBERT SAUNDBY.

LOCOMOTOR ATAXIA (*Tabes Dorsalis*).—The variety of the symptoms is so wide, and their grouping so irregular, that it is difficult to give a general definition of the disease. Broadly, it may be said that the affection is characterized clinically by the absence of the knee-jerk, by inco-ordination of movement, by the absence of nutritive changes in the muscles of the affected limbs, by the frequent occurrence of pains and

sensory disorders, and by various nervous symptoms which will be described subsequently. The chief anatomical change is sclerosis of the posterior columns of the spinal cord, and more especially of the posterior-root zones.

Symptoms.—The occurrence of severe pains, especially if they be of short or momentary duration, together with absence of the knee-jerk, strongly suggests the probability of locomotor ataxy. These may be the only indications for months or years, but sooner or later the disease usually justifies its name and symptoms of ataxy or inco-ordination make their appearance. Among other symptoms likely to occur at an early period are diminution of sensibility of the soles of the feet, temporary paralysis of the external ocular muscles, incontinence of the urine or difficulty in passing it, loss of sexual power sometimes preceded by marked increase, and lastly loss of the reflex action of the iris to light.

It will now be necessary to describe the various symptoms of the disease individually.

Pains.—Most commonly they are sudden, so-called "lightning pains," affecting mainly the lower limbs, but sometimes also the arms, head and trunk. Occasionally the pains are described as burning, stabbing, constrictive or rheumatic. The attacks tend to come on in paroxysms, lasting a few hours or a few days. The pains may or may not follow the distribution of a nerve. In rare cases an erythematous, vesicular, herpetic or bullous eruption appears in the track of the pain, especially when this can be referred to the distribution of an individual nerve.

Visceral pains are present in many cases; they are usually paroxysmal and very severe. When referable to the stomach they are accompanied by obstinate vomiting, faintness, and occasionally by slowness or irregularity of the action of the heart. Such attacks are termed "gastric crises." Rectal, nephralgic, vesical, urethral, bronchial and laryngeal crises are also described. Of these the last only demands notice. Most commonly there is severe paroxysmal dyspnoea, due to laryngeal spasm, and resembling an attack of laryngismus stridulus. In some of these cases paralysis of the abductors of the larynx has been found.

Sensory Disorders.—Loss or diminution of sensibility is usually present in an ordinary case. It commonly affects the lower limbs, and more especially the soles, which feel to the patient when standing as though padded. Anæsthesia

may involve the arms, trunk, and rarely the head. All the various forms of sensibility may be affected, but some may be involved more than others. Retardation of perception and impaired localization are common. Anæsthesia may be present in other parts, such as the muscles, joints, or even the viscera. The muscular sense is usually diminished in the advanced stages, so that the patient does not know the position of his limbs when the eyes are closed.

Motor Symptoms.—Inco-ordination is the special motor symptom in locomotor ataxia, and usually supervenes slowly. At first the condition is one simply of clumsiness, as shown by some difficulty in walking in the dark, or in attempting to turn round quickly when walking. If the patient be made to stand with his feet together, his eyes being closed, he sways, and may fall unless supported. Later on the gait becomes affected in a characteristic way. Standing with the trunk bent forwards and the legs apart, his eyes fixed on the ground, the patient proceeds by throwing the limb forwards and outwards, at the same time raising it too high. The foot is brought to the ground violently, the heel touching first. As each limb is brought forwards in progression the trunk is moved from side to side and the arms thrown here and there in order to maintain the equilibrium. After a few steps the gait becomes less irregular, and the patient may walk a considerable distance with comparative ease. At an advanced period walking, or even the upright posture, may be impossible. But as the patient lies in bed the ataxy of his lower limbs is very evident when he tries to touch an object with his foot. Throughout the disease the muscles of the lower limbs, however great the inco-ordination, usually preserve their normal bulk and strength and the electrical reactions are intact. The upper limbs frequently become affected with inco-ordination. Often writing is first noticed to be imperfect, or some difficulty is experienced in picking up fine objects or in buttoning or unbuttoning. Inco-ordination of the hands can be brought out by the observer asking the patient to touch his nose with the index finger when the eyes are closed, or to bring the tips of the forefingers together. In other cases the uncertainty of the movements is very obvious, the patient being unable to feed himself or to perform other necessary duties. In exceptional instances the muscles of the trunk are affected by ataxy. Articula-

tion also occasionally becomes slow and jerky from inco-ordination of the muscles concerned.

Reflexes.—The knee-jerk is almost invariably absent at the earliest period, often long before other symptoms make their appearance. The plantar reflex is usually normal, sometimes diminished or delayed, and occasionally in the early stage increased.

Eye Symptoms.—The pupils are often small (*myosis*), and in the great majority of cases the reflex action of the iris to light is abolished, whilst the contraction on accommodation is preserved (Argyll-Robertson phenomenon). The pupils may be unequal or irregular; occasionally they are of average size, or even large. Erb has pointed out that in many cases the pupils do not dilate on painful stimulation of the skin of the neck. Loss of accommodation sometimes occurs from paralysis of the ciliary muscle.

Temporary paralysis of the external ocular muscles, leading to squint and double vision, has already been described as occurring, usually in the early stages. In the advanced periods persistent paralysis may be present, such as ptosis alone or ptosis together with palsy of the other parts supplied by the third nerve, or convergent squint from paralysis of the sixth nerve. Paralysis of the third and sixth nerves is often present in cases having a syphilitic origin. Ataxic nystagmus occurs rarely, and usually when the disease is advanced. The two following forms of paralysis are comparatively rare:—(1) Impaired power of the internal recti when acting together in convergence, the same muscles acting well when associated with the external recti in lateral movements (paralysis of convergence). (2) Ophthalmoplegia externa or paralysis of most or all of the external ocular muscles.

Atrophy of the optic nerve, often quite an early symptom, is present in a certain proportion of cases. This condition gives rise to colour-blindness, to contraction of the visual field, and, lastly (sometimes soon, sometimes after the lapse of years), to total blindness.

Affections of other Cranial Nerves.—Deafness from atrophy of the auditory nerve occurs as a rare condition, and still more uncommon are disturbances of taste and smell. Hemiatrophy of the tongue from disease of the hypoglossal nerve, paralysis of the facial, and paralysis of the abductor muscles of the vocal cords have been described.

Affections of Joints and Bones.—Tabetic

arthropathy usually occurs early in the disease, and affects mainly the large joints, such as the hips, knees, ankles and shoulders. In many cases the affection commences suddenly, with painless effusion into and around the joint. Later on disorganizing changes may take place, the cartilages becoming eroded, the heads of the bones atrophied, and the ligaments calcified. Bony out-growths are often developed in and around the affected joint after the lapse of time. Dislocations are frequent. The shafts of the bones sometimes become brittle, spontaneous fractures occurring; the union of such fractures is accompanied by an over-abundant callus.

Various Trophic Changes.—Cutaneous eruptions have already been described as occurring after the paroxysmal pains. Perforating ulcer of the foot is not unfrequent. Nutritive changes in the nails, falling out of the teeth, changes in the pigmentation of the skin and hair are of occasional occurrence. Sometimes rapid wasting of muscles supervenes in ataxy, and in such cases there is every reason to believe that the anterior grey matter of the cord has been affected secondarily.

Course of the Disease.—This is subject to considerable variations. Sometimes the affection does not pass beyond the first stage, which is characterized by absence of the knee-jerk, lancinating pains and slight unsteadiness, with perhaps absence of the light reflex of the iris. In a typical case, anæsthesia with marked inco-ordination sooner or later makes its appearance. Not uncommonly, when these symptoms become evident, the lightning pains disappear or become less frequent and severe. At a later period the various symptoms are very irregular in their appearance and development. Sometimes the disease, in whatever stage it may be, remains without material change for months or years; sometimes abrupt exacerbations occur, often dependent on secondary extension in the nervous centres or on affection of the peripheral nerves. Occasionally marked amelioration takes place, and the improvement may be maintained for considerable periods. Death usually proceeds from intercurrent maladies, but occasionally it results from complications occurring in the course of the disease, such as cystitis and pyelitis, or to the formation of bed-sores.

Complications.—Extension of the morbid process to other parts of the cord may take place. When the lateral

columns are invaded, marked muscular weakness without wasting is superadded to the inco-ordination. Muscular atrophy from involvement of the anterior grey matter is not uncommon, and as a rare condition true progressive muscular atrophy may be noted. Symptoms of locomotor ataxy are frequent in general paralysis of the insane, sometimes preceding, sometimes following, the characteristic features of the latter disease. It may be mentioned here that in ataxy, as in general paralysis, acute cerebral symptoms, such as convulsions, may take place, but their occurrence in the former is much rarer than in the latter. Myelitis may come on in the course of ataxy, and its existence will be made clear by the rapid supervention of various spinal symptoms, such as diffuse muscular wasting, with loss of sensation and urinary complications. Ordinary hemiplegia occasionally co-exists with locomotor ataxy, and sometimes symptoms due to independent syphilitic lesions in the brain. Cardiac disease, especially aortic valvular incompetency, is present in a significant proportion of cases of ataxy.

Diagnosis.—The difficulty in diagnosis in the early stage has been already mentioned, and the symptoms which suggest commencing tabes have been described. There will usually be no trouble in differentiating between diphtheritic paralysis and locomotor ataxy. Occasionally, however, the absence of the knee-jerk is the sole indication in the former of any change in the nervous system. In such a case the suspicion of early tabes may arise, but a careful inquiry into the history of the patient will almost invariably clear up the diagnosis. In alcoholic neuritis symptoms resembling locomotor ataxy are sometimes present. The history of alcoholism, the presence of motor weakness as well as of inco-ordination, the existence of muscular wasting with change in the electrical reactions, and the hyperæsthesia on deep pressure are characteristic of alcoholic pseudo-tabes. Disease of the cerebellum is often accompanied by a staggering gait, suggesting locomotor ataxy. In cerebellar disease, however, there are no lightning pains and no impairment of sensation, whereas severe headache, vomiting and optic neuritis are common. The knee-jerk, with few exceptions, is present in cerebellar disease. In general paralysis of the insane, tabetic symptoms are frequent, and not uncommonly play a

prominent part in the symptomatology. In some cases the only indication of the more serious affection may be slight tremor of the face, with some defect of speech and possibly some degree of emotional disturbance. In every case of ataxy having an onset and course more than usually acute the suspicion of general paralysis should be entertained. It occasionally happens that ataxy forms a marked symptom in disseminated sclerosis. Some of the characteristic symptoms, such as nystagmus, vertigo, tremors of the hands and tongue, and the slow, scanning speech, will usually be found even at an early period. The points of difference between locomotor ataxy and other diseases of the spinal cord do not call for special notice.

Prognosis.—The disease, as has already been stated, is subject to many variations. Its course is essentially chronic, but fortunately by no means always progressive. Inco-ordination may never be present, or, if present, may be insignificant. Remarkable improvement frequently occurs independent of treatment, and this is occasionally the case even in the advanced stages of the disease. The lightning pains usually tend to become less severe and frequent in the course of time. Visual defects from disease of the optic nerve as a rule undergo no improvement.

Morbid Anatomy and Pathology.—The spinal pia mater is thickened and adherent, especially on the posterior surface, and the cord itself is reduced in size and flattened from before backwards. The posterior nerve roots are grey and atrophied in the lower part of the cord. On section, the posterior columns in the sacral and lumbar regions show extensive grey, translucent change; higher up the degeneration is less obvious, and is usually limited to the postero-median columns in the cervical region. Sometimes degeneration in the lateral columns can be made out by the naked eye. The precise degree of change in the posterior columns is subject to certain variations.

Not unfrequently the entire extent of the posterior columns is degenerated in the sacral and lumbar regions, the postero-external columns or posterior root-zones becoming less and less affected on passing from the lumbar enlargement upwards. The anterior part of the postero-external column is often only slightly affected. The postero-median columns invariably undergo degeneration throughout their entire

length, the change being traceable to the fasciculi graciles—the continuation of these columns in the medulla. In some cases the posterior root-zones are involved in the dorsal and cervical regions, and in exceptional cases the entire posterior columns may be densely sclerosed throughout all the regions of the cord. A comma-shaped tract of fibres, degenerating from above downwards, and probably commissural, is often found degenerated in the dorsal region, where it occupies the middle of the anterior part of the posterior columns. The fibres of the posterior cornu frequently undergo degeneration, as well as Clarke's posterior vesicular columns and Lissauer's tract. The so-called antero-lateral tract and the direct cerebellar tract are commonly degenerated, and occasionally the pyramidal tracts are invaded. Rarely the cells in the anterior grey matter undergo atrophy from extension of the disease in the posterior columns along the internal radicular fasciculi.

The histological characters of the degeneration call for no special note. It may be stated, however, that the walls of the small vessels are usually much thickened, and that the sclerosis is often most obvious in their neighbourhood. The primary change, however, consists in a degeneration of the nerve fibres in the posterior roots, the sclerosis being secondary. In some cases the peripheral nerves have been found degenerated. Many of the symptoms of *tabes dorsalis* are easily intelligible from the consideration of the morbid anatomy of the disease. The pains are due to irritation of the posterior nerve roots, but it is not so easy to explain the intermittent character of these pains; possibly it may be ascribed to changes in vascular supply or pressure. Anaesthesia is caused by destruction of the posterior roots and the loss of the knee-jerk by disease of the afferent part of the reflex loop. Acute muscular wasting and marked paralysis without atrophy are due respectively to secondary implication of the anterior grey matter and of the lateral columns. Certain symptoms are clearly dependent on affection of the peripheral and cranial nerves. It is believed by many that trophic changes in the skin, bones and joints are caused by degeneration of peripheral nerves, but on this point there is still difference of opinion. No satisfactory explanation of the inco-ordination has yet been adduced. Ataxy may be extreme when cutaneous and

muscular anæsthesia are slight or even absent. There, is, indeed, no necessary relation between the two conditions. Gowers suggests that the ataxy may be caused by disease of the sensory muscle nerves. Ross ascribes inco-ordination to destruction of certain fibres in the posterior root-zones, which co-ordinate afferent impulses. The fact that some of the posterior root-fibres pass by the lateral columns of the cord directly to the cerebellum, as shown by Dr. Sherrington and the writer, strongly suggests that the inco-ordination is due to disease of the cerebello-afferent fibres.

Etiology.—The disease is much more common in males than in females, and the majority of cases occur between the ages of thirty and fifty. Prolonged exposure to cold and wet, great mental and bodily exertion, and injury to the spine have probably some share as predisposing agents. Heredity has some influence, the disease occasionally occurring in subjects in which there is a family history of insanity, epilepsy or other nervous affections. The influence of sexual excess and of alcoholism is doubtful. In a considerable proportion of cases, estimated by some observers as high as 50 per cent., a history of syphilis is obtainable. The precise ætiological share which syphilis holds in the production of tabes is uncertain. It is believed by Gowers and others that syphilis, by lowering the resisting power of the nerve-elements, acts indirectly as a permissive agent. The lesion in tabes, however, is of a "system" nature, and hence it is most improbable that it is directly syphilitic.

Treatment.—It is of great importance that the patient be not subjected to any depressing influences, either bodily or mental. Careful attention to diet, and avoidance of excess in alcohol and tobacco, should be enforced. Rest in bed is often followed by marked improvement. Iodide of potassium and mercury have not the beneficial influence that might be expected on the assumption that the disease is related to syphilis. The former drug may be given in doses up to 30 grains three times daily, and with it bromide of potassium may be combined. Nitrate of silver (in doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain) and arsenic are highly recommended by some authorities. Iron, quinine, nux vomica, ergot, belladonna and cod-liver oil have been frequently employed, but their action for good is doubtful. There is, indeed, no reason to think that any drug has a direct specific action

in tabes. Morphine is often the only efficient agent in relieving the lancinating pains. It should be used with caution. Cannabis indica is sometimes a useful substitute.

Hypodermic injections of cocaine applied locally occasionally relieve pain. Antipyrin has also been used with great benefit, but its action is not constant. For the relief of pain, blisters, chloroform applications and the warm bath may also be used. Blisters or the actual cautery to the spine are occasionally of use in the early periods. Sulphur and saline thermal baths and the cold pack have been recommended. The constant current in an ascending direction applied to the back has been occasionally of some benefit, especially when muscular wasting existed. Faradization over the hypogastrium is useful in vesical weakness. The bladder should be regularly emptied and washed out if there be residual urine and evidence of cystitis. Within the last few years nerve-stretching has been performed, chiefly with the view of relieving pain. Occasionally the operation has been followed by improvement in the inco-ordination. The results of nerve-stretching are not always beneficial, and when improvement has followed it has usually been temporary. The great sciatic nerves have usually been selected for operation.

Quite recently Professor Charcot has warmly advocated a method of treatment which was first advocated by Dr. Motchoukowsky, of Odessa. This treatment consists simply in the suspension of the patient by Sayre's apparatus in the ordinary manner. The duration of suspension is, at the outset, half a minute. At each application the period is increased by half a minute, but the longest time should not exceed three or, at the outside, four minutes. The suspensions should not be carried out oftener than every other day. While the patient is suspended he should be made to raise his arms away from the body, and nearly at right angles to it, at intervals of every fifteen or twenty seconds. Under this treatment it is asserted that in most cases inco-ordination becomes less marked, or may even disappear, the lightning pains diminish, the functions of the bladder are partially or entirely restored, sexual power returns, and that anæsthesia may give place to sensibility; the absence of the knee-jerk and the condition of the pupils are persistent. Experience has since shown that this method of treatment is frequently, but not invariably, of

service. In some cases, at least, the beneficial result has been but temporary.

W. B. HADDEN.

LUNACY LAW.—Many very important changes have been effected in the law of lunacy by the Lunacy Act, 1890.

The scope of this article is for the most part restricted to those points which are of importance to the medical practitioner; officers of asylums and those specially engaged in the care of the insane must be presumed to acquaint themselves directly with the Act of Parliament.

The legal provisions for the care of lunatics may be considered as affecting—
I. Private Lunatics, II. Pauper Lunatics, III. Lunatics wandering at large, IV. Criminal Lunatics.

I. PRIVATE LUNATICS, or lunatics maintained out of their own resources, may be either—(a) Chancery patients, (b) Single patients in unlicensed houses, (c) Patients confined in public or private asylums or in registered hospitals under orders and medical certificates.

(a) *Chancery Patients* are those who, being possessed of property, have been found to be of unsound mind and incapable of managing their affairs, upon a petition to the Lord Chancellor by a person interested, and after inquiry before one of the Masters in Lunacy; a commission having been granted by the Lord Chancellor in the nature of the writ *de Lunatico Inquirendo*. The petition must be supported by the affidavits of two medical men. The alleged lunatic has a notice of the proceedings served upon him, may employ a solicitor, and is entitled to demand a jury, unless the Lord Chancellor or his representative considers him, after personal examination, to be incompetent to express this wish. If the patient be found to be a lunatic, "committees" are appointed of the person and of the estate of the lunatic; these offices may be held separately or united in one individual. Lunatics so found are subject to visitation by the Chancery Visitors, three in number, two being physicians and one a barrister. An inquisition of this nature only takes place when the amount of property is considerable. In the case of persons possessing property not exceeding £2000 in value or £100 yearly income, the Lord Chancellor may, without inquiry under a commission, but after giving notice to the alleged lunatic, make an order for management of his property. The petition has to be supported by affi-

davits or by report of one of the Masters in Lunacy or the Commissioners in Lunacy. A patient found lunatic by inquisition may be admitted to an asylum or to single care on the order of the committee of the person, together with an office copy of the appointment of the committee, and without any medical certificates.

If it be found that the alleged lunatic is of unsound mind, so as to be incapable of managing his affairs, but that he is capable of managing himself and is not dangerous to himself or others, a committee of the estate may be appointed, and provision made for the maintenance of the lunatic, although his personal liberty is not interfered with.

If a Chancery patient completely recovers, it is necessary to apply for a "supersedeas" to set aside the finding of the inquisition; but if he become capable of managing himself, although he remains incapable of managing his affairs, the Judge in Lunacy may, if he think it desirable that the ordinary proceedings for a supersedeas should not be insisted upon, make an order superseding the inquisition, and restore the patient to his liberty.

b. Single Patients in Unlicensed Houses.

—A person of unsound mind may be taken care of privately in the house of a relation or friend, without "order" and certificates, the Commissioners having power to visit; but if in the care of a person deriving profit from the charge, the patient must be under an "order" and medical certificates (unless a Chancery patient), and comes directly under the notice of the Commissioners in Lunacy, to whom copies of the above-mentioned documents have to be sent within twenty-four hours of the date of reception. The law relating to the petition and reception order and certificates is the same for single patients as for those in asylums. (See under following section.) The patient must be visited at least once in every two weeks by a medical man not deriving, and not connected with those deriving, profit from the charge of him, who must keep notes of the patient's condition in a medical journal and "Medical Visitation Book," and must forward to the Commissioners at the expiration of one month from his reception a statement of the bodily and mental condition. He must not have signed either of the certificates for the patient's reception. Notice has also to be sent of the death, removal, discharge, escape or recapture of the patient. A pa-

tient can be transferred from single care to the charge of another person, or to a licensed house or registered hospital, with the consent of the Commissioners, upon the original certificates. Not more than one patient may be detained in this way without a licence, unless the Commissioners are satisfied that it is desirable, under special circumstances, and for the interest of the patient, that one or more additional patients should reside in the same house.

c. Patients (other than those found lunatic by inquisition) in Licensed Houses (Private Asylums) or Registered Hospitals.

It is provided by the Act of 1890, that with certain exceptions :—

No person, not being a pauper or a criminal lunatic, and not being found a lunatic by inquisition, shall be received and detained as a lunatic in any asylum, hospital, or licensed house, or as a single patient, unless under a reception order made by a county court judge or magistrate, or by a justice of the peace, specially appointed, and having jurisdiction in the place where the lunatic is. No relative of the person applying for an order, or of the lunatic, or of the husband or wife of the lunatic, can make such an order.

The *Order* (Form 3) is to be obtained upon a private application by a *Petition* (Form 1) accompanied by a *Statement of the Particulars* (Form 2) and by two *Medical Certificates* (Form 8) on separate sheets of paper under the hands of two medical practitioners (*vide infra*).

The Petition.—The petition is to be presented, if possible, by the husband or wife, or by a relative of the patient. If not, it must contain a statement of the reasons why the petition is not so presented, and of the connection of the petitioner with the patient, and the circumstances under which he presents the petition.

No person can present a petition unless he be at least twenty-one years old, and has seen the patient within fourteen days.

The petitioner must undertake that he will visit the patient once at least in every six months, but he may appoint a deputy.

The Medical Certificates.—One of the medical certificates accompanying the petition, must, whenever practicable, be given by the usual medical attendant of the patient. If for any reason it is not practicable to obtain a certificate from him, the reason must be stated in

writing to the presiding magistrate, by the petitioner.

No order can be made upon a petition unless each of the persons who sign the medical certificates accompanying the petition, separately from the other, has personally examined the patient not more than seven clear days previously to the date of the presentation of the petition.

The medical men signing must not be partners, nor one the assistant of the other, nor be nearly related to each other, or to the person who signs the petition or urgency order, and they must be duly registered and in actual practice. Further, they must have no connection with the Institution into which the patient is to be received.

Proceedings on Presentation of the Petition.—Upon the presentation of the petition and certificates, the presiding magistrate considers the statements they contain, and decides whether it is necessary for him to see and examine the patient personally; and may either make an order at once, or appoint a time, not being more than seven days after the presentation of the petition, for its consideration: and may make any further inquiries concerning the patient which he may consider necessary. Notice of the time and place appointed for the consideration of the petition (unless personally given to the petitioner) must be sent to him by post in a registered letter.

The presiding magistrate if not satisfied with the evidence of lunacy appearing in the medical certificates, may visit the patient wherever he may happen to be. In carrying out these duties, the magistrate is invested with the same powers as he has when sitting in his court.

Consideration of the Petition.—The petition is considered in private, and no one except the petitioner, the patient (unless the magistrate order otherwise), one person appointed by the patient, and the persons signing the medical certificates are allowed to be present without the leave of the magistrate.

The magistrate may make an order or may dismiss the petition, or adjourn the consideration of it for a period of not more than a fortnight for further evidence, and may give notice to any one he pleases of the adjournment, and may summon any one to attend before him.

Every one present at the consideration of a petition for a reception order (including the presiding magistrate), or who has official knowledge of the fact that a petition has been presented except the

patient and the person appointed by him already referred to, is bound to keep his knowledge secret.

If the petition be dismissed, the magistrate must give the petitioner a statement in writing of his reasons for dismissing it, and must send a copy of the statement to the Commissioners in Lunacy, and when the patient is detained under an Urgency Order, he must send notice to the person in whose charge the patient is, that the petition has been dismissed.

The magistrate, if requested by the Commissioners in Lunacy, must give them all information they may require as to the circumstances under which an order was made or refused, and they may communicate the information to the patient or to any one who satisfies them that he is a proper person to receive it.

If, after a petition has been dismissed, another petition be presented about the same patient, the petitioner, should he have any knowledge with regard to the previous petition and its dismissal, must state it in his petition, and must obtain from the Commissioners, and present with his petition, a copy of the statement sent to them of the reasons for dismissing the previous petition, and, if he wilfully omit to comply with this regulation, he is declared guilty of a misdemeanour.

The Reception Order.—A reception order, if in conformity with the Act, is a sufficient authority for the petitioner or any person authorized by him to take the patient to the place mentioned in the order and for his reception and detention there.

The order, with the petition, statement of particulars, and medical certificates, must be delivered or sent by post to the person on whose petition it was made, and he or his agent must deliver it to the superintendent or proprietor of the asylum or hospital, or licensed house in which the lunatic is to be received and to the person who is to receive him.

Unless a reception order be acted upon within seven clear days from its date, it becomes invalid.

A person upon whose petition a reception order is made, has the same powers and liabilities as, by the Lunacy Acts, formerly belonged to a person signing an order for the reception of a lunatic not a pauper.

A reception order expires at the end of one year from its date, and any order dated three months or more before the commencement of the Act expires at the end of one year after the commencement of the Act, unless such orders are continued.

If the patient has not been personally seen by the magistrate who made the order, he has the right to be taken before or visited by a judge or a magistrate, unless the medical superintendent of the asylum, or the medical proprietor or attendant of the house, or in the case of a single patient, the medical attendant, within twenty-four hours after the patient's reception, in a certificate signed and sent to the Commissioners, states that the exercise of the right would be prejudicial to the patient.

In all other cases the responsible person must, within twenty-four hours after his reception, give to the patient a notice in writing of this right, and must ascertain whether he desires to exercise it; and if within seven days after his reception he expresses his desire to exercise this right, then the superintendent or person in charge must get him to sign a notice to that effect, and he must immediately send the notice by post in a registered letter to the magistrate who is appointed to exercise this jurisdiction or to the clerk of the justices of the petty sessional division or borough, where the lunatic is, to be forwarded to the magistrate, who must thereupon arrange, as soon as possible, either to visit the patient or to have him brought before him by the superintendent, or person in whose charge he is. Any one omitting to perform this duty is guilty of a misdemeanour.

Urgency Orders.—Important provision is made for the immediate care of the insane in exceptional cases by means of these orders (see Form 4).

When it is expedient, either for the welfare of the patient (not being a pauper) or for the public safety, that he should be forthwith confined, he may be received and detained upon an urgency order, made (if possible) by the husband or wife or by a relative, accompanied by one medical certificate (see Form 4).

The medical practitioner who signs the certificate must have personally examined the patient not more than two clear days previously to the reception of the patient, and the date of the examination must be stated in the certificate.

An urgency order may be signed before or after the medical certificate.

If an urgency order be not signed by the husband or wife or by a relative of the patient, the reasons why it is not so signed and the connection of the person signing it with the patient, and the circumstances under which he signs it, must be stated in the order.

No one can sign an urgency order unless he be at least twenty-one years old, and he must have seen the patient within two days before the date of the order.

An urgency order may be made either before or after a petition for a reception order has been presented (or an application made to the Judge in Lunacy, in cases where the reception order is to be made by the Judge in Lunacy). If an urgency order be made before a petition has been presented, it must be referred to in the petition, and if made after the petition has been presented, the petitioner must immediately send a copy of it to the magistrate to whom the petition has been presented.

An urgency order only remains in force for seven days from its date; but if a petition for a reception order or an application to the Judge in Lunacy be pending, then it is good until the petition or application is finally disposed of.

A statement of particulars must be annexed to an urgency order.

Discharge of Patients.—The Commissioners may visit a patient detained in any hospital or licensed house, or as a single patient, and may, within seven days after their visit, if the patient appear to them to be detained without sufficient cause, make an order for his discharge.

An order for the examination by two medical practitioners, of any patient, may be obtained from the Commissioners upon the application of any one, whether a relative or friend or not, who shall satisfy them that it is proper for them to grant such an order; and on production of the certificates of the medical practitioners so authorized, certifying that after two separate examinations with at least seven days interval, they are of opinion that the patient may, without risk or injury to himself or to the public, be discharged, the Commissioners may order the patient to be discharged at the expiration of ten days from the date of the order.

Voluntary Boarders.—The superintendent or proprietor of a licensed house may, with the previous consent of two of the Commissioners, or, where the house is licensed by the justices, of two of the justices, receive and lodge as a boarder for the time specified in the consent, any one who is desirous of voluntarily submitting to treatment. After the expiration of the stated time (unless consent be given for its extension) he must be discharged.

Protection to Persons signing Certificates, &c.—The following provisions are of great importance to medical men:—

“A person who before the passing of this Act has signed or carried out or done any act with a view to sign or carry out an order purporting to be a reception order, or a medical certificate that a person is of unsound mind, and a person who after the passing of this Act presents a petition for any such order, or signs or carries out or does any act with a view to sign or carry out an order purporting to be a reception order, or any report or certificate purporting to be a report or certificate under this Act, or does anything in pursuance of this Act, shall not be liable to any civil or criminal proceedings, whether on the ground of want of jurisdiction, or any other ground, if such person has acted in good faith and with reasonable care.”

“If any proceedings are taken against any person for signing or carrying out or doing any act with a view to sign or carry out any such order, report, or certificate, or presenting any such petition as in the last preceding sub-section mentioned, or doing anything in pursuance of this Act, such proceedings may, upon summary application to the High Court of Justice or a Judge thereof, be stayed upon such terms as to costs and otherwise as the Court or Judge may think fit, if the Court or Judge is satisfied that there is no reasonable ground for alleging want of good faith or reasonable care.”

II. PAUPER LUNATICS.—Lunatics who were paupers before becoming insane, or who become paupers as a result of lunacy, must be relieved by the guardians or other local authorities charged with the relief of the poor. They may, according to circumstances, be kept in the workhouse, or be lodged with friends or relatives, or be boarded out, or be sent to the county or borough asylum, being in all cases under the supervision of the Lunacy Commissioners. For admission to a county asylum it is necessary that the “reception order” should be signed (after examination) by a justice of the peace. One medical certificate only is required, usually signed by the medical officer of the parish. If certificates are signed by a medical man called in specially, and also by the medical officer of the parish, the justice has no alternative but to sign the necessary reception order. The latter differs somewhat in form from that for private patients, but the form of certificate is the same.

FORM 2.

Statement of Particulars.

STATEMENT of particulars referred to in the annexed petition [or in the above or annexed order].

The following is a statement of particulars relating to the said *A.B.* [1]:—

Name of patient, with Christian name at length.

Sex and age.

†Married, single, or widowed.

†Rank, profession, or previous occupation (if any).

†Religious persuasion.

Residence at or immediately previous to the date hereof.

†Whether first attack.

Age on first attack.

When and where previously under care and treatment as a lunatic, idiot, or person of unsound mind.

†Duration of existing attack.

Supposed cause.

Whether subject to epilepsy.

Whether suicidal.

Whether dangerous to others, and in what way.

Whether any near relative has been afflicted with insanity.

Names, Christian names, and full postal addresses of one or more relatives of the patient.

Name of the person to whom notice of death to be sent, and full postal address if not already given.

Name and full postal address of the usual medical attendant of the patient.

(Signed)

When the petitioner or person signing an urgency order is not the person who signs the statement, add the following particulars concerning the person who signs the statement.

{	<p>Name, with Christian name at length.</p> <p>Rank, profession, or occupation (if any).</p> <p>How related to or otherwise connected with the patient.</p>
---	---

[1] If any particulars are not known, the fact is to be so stated.
[Where the patient is in the petition or order described as an idiot omit the particulars marked †].

FORM 3.

Order for reception of a private patient to be made by a Judge of County Courts, Stipendiary Magistrate, or Justice appointed under the Lunacy Acts Amendment Act, 1889.

I, the undersigned *E.F.*, being the Judge of the County Court of [or the Stipendiary Magistrate for,

Justice for specially appointed under the Lunacy Act 1890] upon the petition of *C.D.*, of [1] in the matter of *A.B.* a lunatic, [2] accompanied by the medical certificates of *G.H.* and *I.J.* hereto annexed, and upon the undertaking of the said *C.D.* to visit the said *A.B.* personally or by some one specially appointed by the said *C.D.* once at least in every six months while under care and treatment under this order, hereby authorize you to receive the said *A.B.* as a patient into your asylum [3]. And I declare that I have [or have not] personally seen the said *A.B.* before making this order.

Dated

(Signed) *E.F.*

The Judge of the County Court of

[or a Stipendiary Magistrate, or a Justice for

appointed under the above-mentioned Act.]

To [4]

[1] Address and description.
[2] Or an idiot or person of unsound mind
[3] Or hospital or house or as a single patient.
[4] To be addressed to the medical superintendent of the asylum or hospital, or to the proprietor or superintendent of the house in which the patient is to be placed.

FORM 4.

Form of Urgency Order for the reception of a private patient.

I, the undersigned, being a person twenty-one years of age, hereby authorize you to receive as a patient into your house [1] *A.B.*, as a lunatic [2], whom I last saw at _____ on the [3] _____ day of 18 ____ . I am not related to or connected with the person signing the certificate which accompanies this order in any of the ways mentioned in the margin [4]. Subjoined [or annexed] hereto [5] is a statement of particulars relating to the said *A.B.*

[1] Or hospital or asylum or as a single patient.

[2] Or an idiot or a person of unsound mind.

[3] Some day within two days before the date of the order.

[4] Husband, wife, father, father-in-law, mother, mother-in-law, son, son-in-law, daughter, daughter-in-law, brother, brother-in-law, sister, sister-in-law, partner, or assistant.

[5] See Form II.

[6] Describing house or hospital or asylum by situation and name.

(Signed)

Name and Christian name at length
Rank, profession, or occupation (if any)
Full postal address

How related to or connected with the patient.

[If not the husband or wife or a relative of the patient, the person signing to state as briefly as possible :—1. Why the order is not signed by the husband or wife or a relative of the patient. 2. His or her connexion with the patient, and the circumstances under which he or she signs.]

Dated this _____

day of _____

18 ____ .

To _____
house [6] [or hospital or asylum].

FORM 8.

Certificate of Medical Practitioner.

[1] Insert residence of patient.

[2] City or borough, as the case may be.

[3] Insert profession or occupation, if any.

[4] Insert the place of examination, giving the name of the street, with number or name of house, or should there be no number, the Christian and surname of occupier.

[5] City or borough, as the case may be.

[6] Omit this where only one certificate is required.

[7] If the same or other facts were observed previous to the time of

In the matter of *A.B.* of [1] _____ in the county [2] of _____
[3], an alleged lunatic.

I, the undersigned *C.D.*, do hereby certify as follows :—

1. I am a person registered under the Medical Act, 1858, and I am in the actual practice of the medical profession.

2. On the _____ day of _____ 18 ____, at [4] in the county of [5] _____ [separately from any other practitioner] [6], I personally examined the said *A.B.*, and came to the conclusion that he is a [lunatic, an idiot, or a person of unsound mind] and a proper person to be taken charge of and detained under care and treatment.

3. I formed this conclusion on the following grounds, viz. :—

(a) Facts indicating insanity observed by myself at the time of examination [7], viz. :—

(b) Facts communicated by others, viz. :—[8]

[If an urgency certificate is required it must be added here. See Form 9.]

If the lunatic is to be received as a single patient in a house belonging to or kept by a medical practitioner under the order of a county court judge, magistrate, or justice, add the following paragraph :—

4. The said *A.B.* appeared to me to be [or not to be] in a fit condition of bodily health to be removed to an asylum, hospital, or licensed house.[9]

5. I give this certificate having first read the section of the Act of Parliament printed below.

Dated (Signed) C.D. of [10]

Extract from Section 317 of the Lunacy Act, 1890.

Any person who makes a wilful misstatement of any material fact in any medical or other certificate or in any statement or report of bodily or mental condition under this Act, shall be guilty of misdemeanour.

FORM 9.

Statement accompanying Urgency Order.

I certify that it is expedient for the welfare of the said *A.B.*, [or for the public safety, as the case may be] that the said *A.B.* should be forthwith placed under care and treatment.

My reasons for this conclusion are as follows: [*State them.*]

LUNGS, CIRRHOSIS OF. —

Chronic pneumonia, chronic interstitial pneumonia, indurative pneumonia, ulcerative pneumonia, fibroid induration of the lung, fibroid phthisis, are other names used to designate the same affection, but the term cirrhosis is preferred, as it implies no theory.

The pathological changes included in this condition are so varied that a consideration of them is a necessary preliminary to an account of the clinical features which it presents.

Pathology.—Cirrhosis of the lung is a condition characterized by consolidation of the pulmonary texture consequent upon an overgrowth of connective tissue. Contraction and excavation of the lung, bronchial dilatation, thickening and adhesion of the pleura are generally, but not necessarily, associated with cirrhosis. The pulmonary induration may remain stationary for a long period of time, but more often a tendency to extension is manifested. Fibrous changes in the lung may be the result of several different causes, of which tuberculosis is, without question, the commonest and most important. Few cases of tubercular phthisis run their course without inducing some degree of fibrous induration. Tubercular cirrhosis represents a late stage of phthisis pulmonalis, a chronic infective disease, which is described elsewhere, and cannot be further noticed here.

Non-tubercular indurative lesions of the lung—that is to say, affections which are not the result of constitutional disease, and in which there is no ten-

dency to specific infection of other organs—are therefore alone included in the scope of the present article.

Cirrhosis may be *massive, insular or reticular*. In pronounced instances of the *massive* form, one or more lobes of the lung are converted into a tough, greyish, airless substance, which commonly shows irregular pigmentation or marbling on section. In the early stages the consolidation closely resembles red hepatization, from which it is only distinguished by its greater toughness. The consolidation may be uniform, or small islets of partially spongy tissue may be scattered through the solid lung.

The disease is generally confined to one lung, and the lower lobe, as a rule, is mainly or exclusively affected, though the whole lung may be more or less involved. In rare cases cirrhosis may attack the upper lobe in the first instance.

Except in the early stages, some degree of shrinking of the affected lung is an invariable occurrence. The bronchi commonly show a diffuse cylindrical dilatation, saccular expansions being less frequently observed. Sacculated bronchiectasis is very apt to be complicated by ulceration of the bronchial wall, giving rise to irregular cavities; but ulcerative excavation of the lung may develop without the intervention of bronchial dilatation. It is important, however, to recognize that bronchiectasis and the formation of vomicae are not essential accompaniments of the cirrhotic process.

The *insular* type of cirrhosis is sometimes met with in the less diseased por-

the examination, the certifier is at liberty to subjoin them in a separate paragraph. [8] The names and Christian names (if known) of informants to be given, with their addresses and descriptions. [9] Strike out this clause in case of a private patient whose removal is not proposed. [10] Insert full postal address.

tions of lungs affected with massive induration, but in other cases it constitutes the prevailing character of the lesion. Saccular dilatation of the bronchi is more generally combined with this variety of cirrhosis than with any other, but at the same time cylindrical bronchiectasis is also very common. The lung tissue separating the indurated patches may be unaltered, or it may be marked by fibrous strands extending from the larger cirrhotic foci. Varying degrees of emphysema are also very common.

In the *reticular* form of cirrhosis the lung is traversed by pigmented, tough, fibrous bands, which cross one another at various points, forming a sort of trellis-work. This change may be confined to the base, or to special parts of the organ, and in exceptional cases may be uniformly distributed throughout both lungs. The intervening tissue is often more or less emphysematous, and sometimes presents a condition of brown induration.

Emphysema has been a prominent feature in the few cases that the present writer has met with. Bronchial dilatation is either slight or absent.

Caseous nodules are absent in all forms of this affection, but tuberculosis occasionally develops as a secondary disease in cases of advanced non-tubercular cirrhosis.

Small aneurysms sometimes develop in the cavities, as in cases of chronic tubercular phthisis, and give rise to fatal hæmorrhage. Slight hæmoptysis may be produced by erosion of small vessels in the cavity walls, and possibly also by rupture of the dilated capillaries in the diseased bronchioles. In all forms of cirrhosis some degree of thickening and adhesion of the pleura is almost invariably present, and this condition is most pronounced where the induration of the lung is greatest. The pleura may be comparatively little affected in reticular cirrhosis.

As regards the relation between bronchiectasis and cirrhosis, it may be shortly stated that bronchial dilatation in the great majority of cases is secondary to pulmonary induration. Shrinking of the lung tissue by its traction on the tubes, coupled with the greater influence of inspiratory pressure on the elastic bronchial walls than on the unyielding thoracic parietes, the expiratory pressure of cough, diminished power of resistance on the part of the altered bronchial tissues, and accumulation of secretions

in the tubes surrounded by rigid lung, are probably all concerned in different degrees in the production of bronchiectasis. Bronchial dilatation occasionally leads to gangrene of the lung.

The *microscopical appearances* consist in a growth of connective tissue replacing the vesicular structure of the lung. In some cases a small-celled infiltration is found irregularly distributed about the margins of the cirrhotic masses. At other times sharply defined, rounded collections of small cells, possibly distended lymphatic vessels, are seen in various parts. Collapsed alveoli with thickened walls, and irregular spaces lined with short, cubical epithelium suggesting an adenomatous structure, and due to compression of groups of air sacs and alveolar passages, are also common appearances. Bunches of dilated capillaries may often be seen in large numbers, especially in the walls of the smaller bronchi.

The changes just described refer more especially to cirrhosis of long standing. In the earlier stages the disease may often be seen to consist essentially of a fibro-cellular thickening of the alveolar walls, causing compression and collapse of the pulmonary vesicles. A similar growth is almost invariably witnessed in the interlobular and peri-bronchial spaces. The alveoli in many places contain collections of large epithelial cells and leucocytes, but in some instances they are filled with an opaque fibrinous material, and no distinct epithelial lining is visible. In such cases it is not unusual to find evidence of a process of intra-alveolar cirrhosis, depending on the ingrowth of granulation tissue from the alveolar walls into the substance of the fibrinous plug. This process has with much reason been likened to the organization of a thrombus.

The development of connective tissue cannot always be traced to the alveolar walls, even in the early stages, and the fibrous growth seems to start from the peri-bronchial and peri-vascular sheaths. The framework of the lung consists of the sub-pleural, interlobular, peri-bronchial and inter-alveolar connective tissue, which is continuous throughout, and is brought into the closest relationship through the lymphatic and bronchial blood-vessels which ramify along these lines. Hence it is easy to understand how any irritant acting upon one part of the pulmonary connective tissue may affect other sections of the same system.

In comparatively rare cases the cirrhotic process commences at the pleural surface, and spreads inwards along the interlobular septa.

The smaller bronchi always show some alteration, being usually more or less dilated and distended with secretion. The epithelium, as a rule, has undergone irregular desquamation, groups of columnar, ciliated or short cubical cells being separated by gaps where no epithelial lining remains. The basement membrane is sometimes thickened and glassy-looking; at other times no trace of this structure is visible, the bronchial wall being lined by an irregular granulating surface. A cellular infiltration and a varying amount of fibrous growth commonly exist in the coats of the bronchi, the fibrous change reaching its highest development in the external layer. The cartilages may disappear or may undergo a fibrous or calcareous transformation. The mucous glands are commonly atrophied, owing to implication in the indurative process, and the orifices of the ducts are dilated. The larger bronchiectases and the pulmonary cavities are lined by granulation tissue, small scattered islets of mucous membrane being traceable at times in the bronchiectatic spaces. These morbid conditions are more pronounced in the medium and smaller bronchi, the larger tubes presenting generally the appearances of chronic bronchitis.

The bronchial lesions just described seem to be the starting-point of some examples of the insular and reticular forms of cirrhosis, and the term "peri-bronchitis fibrosa" fitly describes this condition, which, however, is not to be confounded with the small pigmented nodules met with in cases of chronic tubercular phthisis, which are sometimes spoken of as peri-bronchitis, but which in most cases are merely old fibrous tubercles.

Having now given an account of the naked-eye and microscopical appearances of cirrhosis, it remains to discuss the ætiology of the affection.

Ætiology.—If we exclude the circumscribed fibrous lesions due to infarction and perhaps to syphilis, it may be said that pulmonary cirrhosis is the result of the following causes:—

1. *Inflammatory Affections of the Lung.*
—Acute croupous pneumonia may probably, in very exceptional instances, terminate in cirrhosis, though this event is denied by good authorities. Cases have been observed in which an apparently typical

pneumonia has lapsed into a condition of chronic pneumonia or cirrhosis. On the other hand, it is urged that these forms of indurative pneumonia differ from the classical type in certain points, and sometimes present a resemblance to typhoid fever (Wagner). Our knowledge of pneumonia is still very incomplete, and it is not improbable that acute fibrinous exudation into the air sacs may be a consequence of different diseases. In the absence of a decisive test, whether bacteriological or otherwise, the analysis of the various forms of pneumonia is at present beset with difficulties. A sub-acute type of pneumonia has been lately described by Heitler, Talma and others, which may end fatally in a few months or may pass into cirrhosis. The inflammatory changes in this variety are mainly interstitial. The onset of the disease is less acute, and constitutional symptoms are less pronounced than in the true croupous pneumonia.

Broncho-pneumonia, especially when it ensues on measles, whooping-cough, and possibly typhoid fever and diphtheria, is a more frequent source of cirrhosis, particularly in children.

Certain affections of the mediastinal structures may also lead to pulmonary induration, probably through transmission of inflammatory processes along the peri-bronchial sheaths which are continuous with the mediastinal connective tissue. Disease of the sub-tracheal glands, especially suppuration, spinal abscesses, suppuration around the œsophagus, and aneurysm of the aorta, may occasionally in this manner give rise to pulmonary cirrhosis. It is possible that cirrhosis is sometimes the outcome of a primary chronic interstitial pneumonia.

2. *Certain Diseases of the Bronchial Tubes.*—Bronchial dilatation or stenosis, chronic bronchitis resulting from inhalation of finely divided particles, and foreign bodies in the bronchi may occasion fibrous induration of the lung as the result of extension of the inflammatory process.

It is true that bronchiectasis in most cases is a consequence of cirrhosis, but there is no reason to doubt the truth of Laennec's view that bronchial dilatation may be the primary change in some instances.

The rare cases in which stenosis of the main bronchus leads to bronchiectasis, cirrhosis and ulcerative excavation of the lung are also examples of the bronchial origin of pulmonary induration. (Cf. Cases by Pearson Irvine, *Path. Soc.*

Trans., vols. xxviii., xxix., xxx., and by the writer, *ibid.*, vol. xxxvi.) In all these cases, and in those instances where cirrhosis seems to have developed out of a simple chronic bronchitis, the occurrence of broncho-pneumonia, whether sub-acute or chronic, is probably intimately connected with the indurative process.

The inhalation of irritant particles causes chronic bronchitis and peri-bronchitis, and secondary cirrhosis of the lung (pneumo-coniosis). In many cases this affection is so indissolubly associated with chronic phthisis—*e.g.*, miners', steel grinders', potters' phthisis—that the part played by the inhaled dust is difficult to estimate. But there appears to be no doubt that in some instances fibrous changes in the lungs may be produced by dust (Zenker, Traube, and others).

3. *Pulmonary collapse* is another cause of cirrhosis, especially when it is due to bronchitis. Induration is probably the result of extension of the bronchial inflammation to the alveolar walls. This process is therefore closely related to broncho-pneumonia and affection of the bronchial tubes.

4. *Pleurisy* is an occasional cause of cirrhosis, more particularly when the lung has been long collapsed. In this case the induration mainly consists in a patchy or reticular fibrous growth in the peripheral part of the lung, which seldom attains to important dimensions.

Symptoms and Course.—The onset of symptoms may date from an acute pulmonary attack, or more commonly the history is that of chronic bronchitis.

In the first case the constitutional and local symptoms of pneumonia may continue for weeks or months without intermission, the patient ultimately making a gradual and imperfect recovery. Or, again, the acute illness may be succeeded by a sub-acute or chronic stage, which ends fatally in the course of a few months. An interval of apparent good health may separate the initial attack from the onset of symptoms of chronic disease of the lung. In the second case the illness commences insidiously, and appears to be chronic throughout, but attacks of sub-acute bronchitis are very liable to arise from time to time, and these probably lead to the development of broncho-pneumonic processes.

Patients suffering from this condition complain of cough, expectoration, dyspnoea and pains in the chest—in fact, the

symptoms of bronchitis. The severity of the symptoms depends on the extent of lung involved, on the stationary or progressive character of the lesion, and on the presence or absence of bronchitis, bronchiectasis and excavation of the lung. The supervention of constitutional symptoms, like wasting, fever, night sweats, debility and loss of appetite, is determined partly by a tendency to extension on the part of the pulmonary induration, but still more by the development of bronchial dilatation and excavation of the lung, which are apt to give rise to a low septic condition depending upon absorption of the products of suppuration.

The clinical course of the disease under these circumstances can hardly be distinguished from that of chronic phthisis, the same irregular type of pyrexia being observed in both affections. It is commonly said that the progress of non-tubercular cirrhosis is more gradual, nutrition is longer preserved, and constitutional symptoms are less pronounced, but these differences are not to be relied on generally. Laryngeal ulceration, so common in phthisis, is almost unknown in cirrhosis.*

Diarrhoea is not uncommon in the present affection, and sometimes depends on accidental swallowing of the putrid sputa or on amyloid disease of the intestine. Ulceration of the intestine does not occur. In cases uncomplicated by bronchiectasis or by ulcerative changes in the lung, the fatal termination is commonly due to bronchitis with dilatation of the right heart, visceral stasis and dropsy, or to intercurrent pneumonia or œdema of the sound lung.

Where bronchial dilatation or excavation is a prominent feature, the sputum becomes profuse and puriform, and generally acquires a terribly putrid character. The paroxysmal expectoration of large quantities of foul-smelling purulent fluid is very characteristic of bronchiectasis or excavation affecting the lower part of the lung. When these changes are limited to the upper lobe, the secretions gradually drain away by force of gravity, and in such cases cough and expectoration are more continuous. In basic cavities or bronchiectases the

* In a few cases of non-tubercular cirrhosis associated with bronchial dilatation or pulmonary excavation, the writer found laryngeal ulceration, not depending on tuberculosis, and apparently due to the local action of the foul sputum derived from the cavities in the lung.

secretion slowly accumulates, and, until it overflows the margins of the inert cavity walls or bronchial expansion, no cough is induced. But when the acrid fluid trickles over the less diseased bronchial mucous membrane in the neighbourhood of the morbid area, it excites reflex cough and evacuation of the contents of the cavity or dilated tubes.

A tendency to general bronchitis is always very marked in these cases, owing to contamination of the bronchi by the foul fluid passing over them, and to inhalation of noxious materials into the air tubes of the healthy lung.

Bronchitis is very apt to assume a putrid character, and death commonly results from the development of septic broncho-pneumonia or pleurisy. The fatal termination may also be due to abscess of the brain, multiple pyæmic abscesses, phlegmonous erysipelas, exhaustion, amyloid disease of the kidney produced by the long-continued suppuration, nephritis, pulmonary gangrene and hæmoptysis.

The subjects of this disease at times complain of rheumatoid articular pains, which Gerhardt regards as a pyæmic manifestation.

The subjects of pulmonary cirrhosis are generally more or less anæmic and cachectic, though nutrition may be fairly preserved for some time. Clubbing of the fingers is very marked in most instances.

Physical examination discovers signs of consolidation of the lung associated with contraction of the chest walls and displacement of neighbouring organs.

In the ordinary form of cirrhosis the lower part of one side of the thorax is flattened, the respiratory movements are restricted and the heart is displaced to the affected side. Percussion elicits a varying degree of dullness, combined, as a rule, with a marked sense of resistance. At times a somewhat tubular or tympanitic quality of resonance may be associated with the dullness. When the stomach or intestine is drawn up from contraction of the lung, a tympanitic note is produced on percussion over the lower part of the chest. The vocal fremitus and resonance are increased, and the breath sounds acquire a bronchial or tubular character. At times the most cavernous breathing and pectoriloquy may be heard, especially where large bronchi or cavities approach the surface of the lung. Bubbling or metallic râles, of medium or large size, are commonly audible, and, when bronchial dilatation

or excavation exists, a peculiar croaking or sucking rhonchus can often be detected. A succussion or splash sound on cough may sometimes be recognized in such cases. Various rhonchi and râles are frequently heard over the upper part of the same side, or over the healthy lung, pointing to diffuse bronchitis. The resonance of the sound lung commonly extends across the middle line of the sternum. The amount of dullness on the affected side may undergo some diminution in the course of the disease when much emphysema is developed.

The breath sounds and vocal phenomena are liable to great variations, typical cavernous breathing and pectoriloquy alternating with weak indistinct breath sounds and vocal resonance. These differences depend on the amount of fluid contained in the cavities and dilated bronchi.

In some cases the respiratory murmur and vocal phenomena are persistently obscured over the dull area. The presence of dense pleuritic adhesions may contribute to mask the signs of consolidation and excavation.

The expectoration in uncomplicated cirrhosis does not differ from that of bronchitis. The sputum of bronchiectasis has a curious tendency to separate into three layers on standing, a description of which will be found in the article devoted to that subject. When ulcerative changes are proceeding in the lung, elastic fibres may be detected in the expectoration, but tubercle bacilli are absent.

Diagnosis.—Contractile disease limited to the lower part of one lung, combined with signs of excavation or bronchial dilatation, and with marked fœtor of the breath and sputum, is rarely tuberculous. But the same group of physical signs, excluding putridity of the sputum, which is no essential part of simple cirrhosis, may be presented by certain rare cases of chronic basic phthisis.

A failure to detect tubercle bacilli in the sputum after repeated examination would almost negative the idea of pulmonary tuberculosis. It must be remembered, however, that secondary tuberculosis may become grafted upon a simple cirrhosis. The following affections have to be excluded :—

Chronic Pleurisy.—The breath sounds and vocal fremitus are always weakened, there is no evidence of bronchial dilatation or excavation, and the symptoms, both local and constitutional, are less pronounced.

Empyema perforating the lung may closely simulate cirrhosis and bronchial dilatation, but the fœtor has not the special characters of bronchiectasis, and the purulent fluid expectorated does not separate into the characteristic layers. In some cases, an exploratory puncture will alone decide the point.

Chronic abscess of the lung may give rise to contraction and to physical signs hardly distinguishable from those of cirrhosis, but the history of the case and the character of the sputum will usually prevent mistakes.

Hydatid cysts of the lung and liver do not cause contraction, and pulmonary symptoms are slight or absent.

Abscess of the liver perforating the lung is often associated with persistent blood-stained expectoration, and enlargement of the liver can usually be recognized. The history may also throw light on the case.

New growths are mainly distinguished by the absence of contraction and by the existence of symptoms of mediastinal pressure. When external tumours exist the diagnosis presents little difficulty.

Prognosis.—The area of lung involved, the presence or absence of bronchitis, bronchial dilatation and excavation of the lung, and the condition of general nutrition and digestion, are the main elements on which prognosis must rest. Except in those cases where cirrhosis is very limited, the prognosis is always more or less unfavourable, owing to the progressive nature of the disease. At the same time the duration of life is likely to be protracted.

Treatment.—The treatment of cirrhosis of the lung is practically included in that of chronic phthisis, bronchitis and bronchiectasis, and therefore requires but brief notice here. The patient should wear flannel next the skin, he should live in a light airy room, and avoid smoky or dusty atmospheres. A temperate and moderately bracing climate is generally to be preferred. Nutritious food, including cream, milk and cod-liver oil, is of much importance. Iron, quinine and other tonic remedies may be prescribed from time to time. The patient must especially avoid all possible causes of bronchitis, and catarrhal attacks must be promptly met by suitable treatment. Where bronchiectasis or excavation of the lung exists, the patient should endeavour to promote periodical evacuation of the cavities by resorting to certain postures which experience will often suggest—*e.g.*, stooping down, partial inversion, &c.

Drugs like turpentine, terebene, pix liquida and creasote may be administered internally for the purpose of diminishing the fœtor of the breath and expectoration. The same result is sometimes more successfully obtained by the inhalation of creasote, carbolic acid, eucalyptus, iodine and other remedies diluted with chloric ether or rectified spirits in some form of oro-nasal respirator. Cough as a rule should not be treated directly, but this symptom may sometimes be relieved by counter-irritation and expectorants which promote the removal of bronchial secretions. When the cough is so severe and incessant as to prevent sleep, the inhalation of a few drops of oil of peppermint or eucalyptus in the oro-nasal respirator may be attended with marked relief. Opium should only be exhibited in exceptional cases. The question of surgical interference is considered in the article on BRONCHIECTASIS. Diarrhœa, dyspepsia, albuminuria and other complications must be dealt with on general principles. Patients should be specially cautioned against the practice of swallowing their sputa, as diarrhœa and digestive disorders are often produced in this way.

PERCY KIDD.

LUNGS, GANGRENE OF.—Necrosis of a more or less extensive area of the lung following arrest of the circulation, with putrefaction of the sphacelated mass, and the subsequent formation of a cavity or cavities. Gangrene of the lung is produced by a variety of conditions, the majority of which are related to the inhalation of septic material; it is also occasionally a sequel of acute pneumonia.

Symptoms and Physical Signs.—Unless the gangrenous mass be in open communication with a bronchus, its presence may not be detectable. It thus sometimes happens that a gangrenous focus, unsuspected during life, is revealed at the post-mortem examination. The supervention of gangrene is, however, generally denoted by the accession of dyspnoea, the continued irregular hectic fever, and a marked degree of prostration. The patient often presents a pinched and livid appearance. If there be bronchial communication, the extremely foul and penetrating odour of the breath and sputum is characteristic, but not absolutely pathognomonic, as it may be present in putrid bronchitis and bronchiectasis without gangrene. The appearance of the sputum, apart from its odour, is also fairly characteristic. It

consists of greenish or greyish-black matter, and a thin dirty grey or slate-coloured fluid in which muco-purulent masses and the other more solid elements are suspended. Traube considered it to form characteristically three layers, the upper frothy, turbid and brownish-green in colour, the middle layer liquid and serous, the lower thin, brownish and in masses (v. Jaksch).

Microscopically, the sediment and solid masses are found to consist of a quantity of granular debris, oil globules and fat crystals, many bacteria, especially leptothrix, and according to some writers monads are also present. The rarity, or even entire absence, of elastic fibres has been explained by the presence of a ferment which dissolves them (v. Jaksch).

When the gangrenous cavity is in communication with a bronchus, then the physical signs of excavation are present, including cavernous breathing and metallic râles. It must, however, be borne in mind that all the signs of a cavity may be yielded by a congeries of closely aggregated small cavities or even by consolidated lung, and also that there is hardly any safe criterion for determining the size of such a cavity.

Pleurisy may also be present, and in some cases the supervention of pneumothorax is indicated by its special signs. When gangrene supervenes upon chronic lung disease or any of the concomitant conditions mentioned below, there will perhaps be no other indication of its presence beyond the fetor of the breath. Occasionally the occurrence of hæmoptysis denotes that the gangrenous process has eroded a pulmonary vessel. As the disease progresses it is not uncommon for diarrhœa to occur; this is obviously due in the main to the entrance into the alimentary tract of the foul ichorous material discharged from the lung.

The ordinary termination of pulmonary gangrene is by death from exhaustion and septic poisoning. The existence of a gangrenous cavity is likely to lead to the formation of foci of septic bronchopneumonia in other parts of the lung by the inhalation into them of the ichorous matter proceeding from the original focus. In this way it is possible for the opposite lung to become affected, and the chances of recovery are thereby greatly diminished. It would be wrong, however, to say that recovery does not sometimes take place, the conditions for such a favourable issue being a limitation

of the affected area and the maintenance of the patient's strength.

The *diagnosis* has to be made between gangrene and abscess of the lung, and also from putrid bronchitis and bronchiectasis. From abscess the diagnosis is not always possible, for this, like gangrene, may ensue upon pneumonia, and the pus expectorated may have undergone putrefaction. The presence of putrid bronchitis is denoted by an abundant bronchorrhœal secretion of a fetid character, and the diffusion of bronchitic signs throughout the lungs. In the case of bronchiectatic cavities the expectoration is often fetid, and the distinction from gangrene is the more difficult, since the latter condition may supervene on the former.

Prognosis.—From what has already been stated, it is obvious that the prognosis in cases of pulmonary gangrene is very grave.

Morbid Anatomy.—The area of lung involved in gangrene varies considerably in extent. There may be a small limited focus, or the greater part of a lobe may be sphacelated. Or, again, the lobe may be pervaded by numerous areas of "lobular gangrene." As a rule, there is a single cavity of most irregular outline, with blackish discoloured shreds of tissue depending into it on all sides containing a foul grumous material of most penetrating odour. When its contents have been washed away, the ragged cavity remains, in which it is possible to detect the relics of disintegrated bronchi and blood-vessels. In the latter, thrombi may be seen, sometimes extending into branches of large size. The gangrenous focus is mostly surrounded by a more or less wide zone of hepatized or carnified lung.

Laennec, who was the first to describe the clinical and anatomical features of the condition, classed all its forms into the two groups of *diffuse* and *circumscribed*. The distinction is practically unimportant, since in all cases circumscription tends to occur (as in gangrene elsewhere) by reactive inflammation, provided life be sufficiently prolonged. Such definite demarcation and encapsulation of the gangrenous focus is, however, seldom found.

Besides pneumonia, there are several pulmonary lesions which may be associated with gangrene, phthisis, bronchiectasis and cancer being perhaps the most frequent of these. If, as often happens, the focus be situated near the periphery, there is a concomitant pleu-

ritis of intense severity. Pyo-pneumothorax may be set up by the rupture of a gangrenous cavity.

As regards the exact site of the disease, it may be stated that of 20 cases in which pneumonic hepatization or chronic consolidation co-existed with gangrenous cavities, the latter occurred in the right upper lobe in 11, in the right lower lobe in 3, in the left lower lobe in 4. In 2 cases gangrenous foci were found in both lungs—viz., in the right lower lobe and left upper lobe in one, and in the converse lobes in the other.

Pathogeny.—The precise mode of production of pulmonary gangrene is by no means easy to elucidate. As stated above, it must, in accordance with what is known of the general pathology of gangrene, be primarily due to vascular obliteration. Yet the number of cases in which the lesion is clearly traceable to thrombosis or embolism of the pulmonary or bronchial arteries is very small. Simple obstruction from such causes is certainly not productive of gangrene, but of the form of necrosis known as "hæmorrhagic infarction." For gangrene to occur it would seem that there must be an additional factor, viz., sepsis, and it will be seen that this may be the essential element in determining the lesion. At the same time there may, in certain cases, be no proof of the intervention of septic agencies, but only evidence of depraved nutrition, which *per se* may favour the passage of a condition of inflammation into one of gangrene. This may explain the greater liability of post-pneumonic gangrene in typhus, tuberculosis, in the habitual drunkard, and the insane, as well as in diabetes and chronic Bright's disease, constitutional states which are prone to favour similar low forms of inflammation elsewhere than in the lung. It is a moot point whether the nervous system may so control the nutrition of the lung as to determine pneumonia and gangrene. This view, once held, seems no longer tenable. So far, then, as present knowledge permits a classification of the antecedents of gangrene of the lung, they may be divided into the following:—

A. Thrombosis and embolism (mostly septic).

B. Inflammation.

1. Acute lobar pneumonia.
2. Chronic lobar pneumonia.
3. Lobular (septic) pneumonia.

A. Out of a series of 38 cases of gangrene of lung analysed by the writer, there were only 3 in which pulmonary

embolism could be traced, and but 1 with pulmonary thrombosis as an antecedent. In all there was evidence of the septic nature of the process, whilst in 1 another explanation than that of mere thrombosis was possible. It is certainly remarkable that, as regards the lung, the supervention of gangrene upon vascular obstruction alone should be practically unknown.

B. To deal first with *acute pneumonia*. In the series mentioned (38 cases) hepatization was found associated with the gangrene in 14 cases. But in only 8 of these could it be said that the gangrene was dependent on the pneumonia. Laennec thought that pneumonia was always secondary, but he attributed gangrene to a special constitutional tendency, and seems to have regarded it as a disease *sui generis*. It is important to note that in the majority of cases of gangrene following pneumonia there is to be found one or other of the predisposing conditions above alluded to. The same remark applies to *chronic pneumonia*, which is singularly common in association with gangrene (in 6 out of 38 cases). But by far the most frequent antecedent of gangrene is *septic pneumonia*, which is *lobular* in form. This condition may be excited in various ways, all of which are referable to the inhalation into the lung of decomposing or putrescent material. The sources of such products may be thus classified:—

(1) Retained bronchial secretion, as in bronchiectasis, or compression of bronchus by aneurysm, cancer, &c.

(2) Putrid material from extra-pulmonary sources, as the products of ulceration in the mouth, fauces and larynx (noma, diphtheria, cancer), cancerous ulceration of œsophagus ulcerating into air passages or lung (a common cause of gangrene), discharge of a suppurating bronchial gland into a bronchus, especially if it also perforate the gullet.

(3) Foreign bodies in the lung, causing ulceration of a bronchus, and the consequent inhalation of the discharges into the lung, the inhalation of food particles (*Schluck-pneumonie*), or of vomited matters, or of foul water. The latter circumstances may explain the frequency of gangrene in the insane and the paralysed.

Doubtless there are other ways in which putrid or septic material may gain access into the lung and excite a form of lobular pneumonia, which, owing to the presence of putrefactive organisms, passes into gangrene. At the same time

it is highly probable that the process thus initiated is accompanied by blood stasis.

Treatment is general and local. As regards the first, the object is to support the vital powers in the hope that the pulmonary sphacelus may become encapsulated and detached, the cavity then cicatrizing. In all cases it is necessary to administer restoratives, a free amount of stimulant, and as nourishing a diet as possible. Cinchona, with ammonia and ether, or with the mineral acids, is clearly indicated.

Local Treatment.—The inhalation of antiseptic vapours, such as of turpentine, benzoin, eucalyptus, &c., is essential, and it is generally necessary to use disinfectants freely around the bedside and in the sputum.

The propriety of surgical interference for the drainage of gangrenous cavities may be regarded as established, as several cases have been successfully treated. The chances of success depend on the limitation and circumscribed character of the cavity, and also on the existence of pleural adhesions over the affected area. But there are some cases where the cause of the gangrene is of a nature precluding any hope of treatment being other than palliative; but even then an operation may be justifiable, as affording a vent to the fetid products, and thus diminishing the harassing cough, the fetor of the breath and the risk of secondary broncho-pneumonia. The most fortunate results have been obtained where the gangrene occurred in consequence of the impaction of a foreign body in a small bronchus, the operation causing the detachment of this body as well as the drainage of the cavity. The precise localization of the gangrenous area is, however, often a matter of great difficulty. The very nature of the morbid process precludes an invariably successful issue to surgical intervention: but, on the other hand, the rarity of spontaneous cure on expectant treatment would seem to demand such intervention.

SIDNEY COUPLAND.

LUPUS (Lupus Vulgaris).—A chronic disease of the skin and some mucous membranes, characterized by the formation in the connective tissue of nodules of granulation tissue.

The name Lupus was formerly applied to a heterogeneous assemblage of destructive lesions of the skin, but since Willan's time it has been used to denote a disease of a definite clinical type.

Lupus vulgaris, as it is termed in distinction to lupus erythematosus, assumes very many clinical phases, to denote which a multitude of distinguishing appellations have been from time to time used.

Lupus maculosus is a term applied to an affection characterized by the eruption of very soft, smooth, brownish red, semi-translucent (apple-jelly-like) miliary nodules, which develop without subjective sensations in the connective tissue of otherwise healthy skin. This eruption constitutes the earliest sign of lupus, and may also be seen at the periphery of a spreading area, or recurring in scars where the disease has pre-existed. The nodules increase in size, others arise between and around them, and join together to form a more or less circular patch of a special reddish-brown colour. The centre undergoes retrogressive changes beneath the unbroken epidermis and cicatrizes, whilst new miliary nodules may be seen beyond the extending raised border. The inter-papillary processes are flattened out, and hence the patch is smooth and glistening. When the surface desquamates the name *lupus exfoliatus* is by some used to designate the condition.

The term *lupus exulcerans* is used when the destruction of lupus tissue is rapid or intense, or when the epidermis is lost and a secreting ulcerating surface is disclosed. The ulceration may be deep and rapid or phagedænic, and cause great destruction and mutilation. On the removal of the crust, a readily bleeding irregular, granulating surface is seen, composed of a soft, friable neoplasm. Sometimes the connective tissue proliferates very freely, and large granulations form and give the growth a framboesoid aspect.

The term *lupus hypertrophicus* is applied to a condition in which new connective tissue formation predominates over the destructive process, and markedly raised, thick patches result. Sometimes again sclerosed patches are formed by the organization of the new inflammatory tissues.

If, without any breach of surface, the papillæ are irritated and undergo much hypertrophy, a warty-looking patch results, often completely masking the original lupus formation, a phase which is called *lupus verrucosus*.

Further, as a lupus patch spreads or creeps on peripherally it cicatrizes centrally, or at one part of its border, and hence the term *lupus serpiginosus* has arisen.

Lupus is generally stopped by the deep fascia and bones, but necrosis of the latter may result if the periosteum be destroyed. Cartilage is, however, frequently invaded by lupus, as may constantly be seen in the nose and ears, where great destruction and deformity result.

The disease may exist as a single patch or less often as several patches, but it only becomes symmetrical by accident. Sometimes a limb, or the face, neck, and much of the trunk, may be extensively invaded.

The exposed parts of the body, such as the face and hands and feet are by far most frequently attacked.

Primary lupus of the mucous membranes of the nose, mouth, pharynx, larynx, eye and external genitals of the female is far less common than a secondary affection, by extension or infection from the skin. On mucous membranes the little nodules are generally covered by papillary overgrowths and whitish collections of epithelium, and the patches thus formed soon break down into shallow intractable ulcers, with an irregular granulated base.

Course.—Lupus is usually a very chronic disease, persisting over many years, or a lifetime, but the rate of evolution of the nodules and their destruction varies widely, according to the resistance offered by the tissues and to the intensity of the process. A patch may be almost stationary for years, and very limited in extent, or it may spread actively, and break down with surprising rapidity, and be accompanied by the formation of other patches.

Diagnosis.—Mistakes can rarely occur if due attention be given to the presence of the characteristic brownish-red, jelly-like nodules, and the more diffused friable neoplasm, the usually scanty number of patches and the symmetry, the peculiar method of spread, the chronicity, the production of spontaneous scarring, the frequent concomitance of tuberculosis, and the age at onset. It is only when some of these characters are masked that difficulties arise in the diagnosis of lupus vulgaris from lupus erythematosus, or from a chronic localized patch of eczema or psoriasis.

Fungating forms may stimulate epithelioma, and the latter occasionally arises from a lupus patch.

Rodent ulcer is usually situated on the upper two-thirds of the face, and generally affects old people. There is also a history of a continuous spread from a

simple nodule, and the rolled cartilaginous-looking border can be always distinguished. Tuberculated and serpiginous syphilides, whether ulcerating or not, may be almost indistinguishable in aspect, and the age at onset, the far more rapid spread of syphilis, &c., have to be taken into account.

Pathological Histology.—Lupus belongs to the class of infective granulomata. The newly formed tissue consists of a small-celled granulation growth situated about the vessels in the connective tissue, and forming little rounded nodules. In the periphery of the latter, collections of lymphoid cells, larger epithelial and giant cells form, whilst the central parts gradually undergo caseation, a process which overtakes the peripheral portions also. The lupus patch results from the repeated formation of these nodules, which coalesce, and thus the growth extends along the vessels. The connective tissue lying between and about the nodules becomes infiltrated with inflammatory cells, which may become part of the lupus growth, or undergo organization into fibrous tissue. Tubercle bacilli are present in the new growths, but only sparsely.

Ætiology.—The view which is now generally held is that lupus is essentially a tubercular affection of the skin, but this is still opposed by some distinguished observers.

As already stated, it histologically resembles tuberculosis, but the process in this affection is less acute and less intense. Caseation is a less-marked feature, the epithelial cells are fewer, and the giant cells more numerous, the miliary nodules are less distinctly isolated and circumscribed than in pulmonary tuberculosis.

Clinically, also, the evidence is very strong. It is undoubtedly an infective process. The disease is frequently associated with tuberculosis or so-called scrofulosis of glands, joints and bones, and it may result from the extension to the skin of a tuberculous gland or cold abscess. Evidence is also forthcoming that, though purely a local process in the skin, the subject is not without danger of acquiring general tuberculosis, and inoculation experiments on animals point in the same direction.

Those who hold that it is not a phase of tuberculosis consider it a disease *sui generis*.

Lupus is not hereditary; it but rarely attacks two or more members of a family simultaneously, and is far more frequent

in females than males. It mostly commences in childhood, between the third and tenth years, and after puberty its onset becomes rarer, but it may appear at any age, even in advanced life.

Treatment.—Whether lupus be a phase of tuberculosis or not it is necessary that the disease should be removed, and at an early stage, especially when situated about the face, so that the distressing disfigurements which it entails may be avoided. Lupus very seldom dies out spontaneously, and then only after having committed ravages. No specific is known; indeed, lupus is absolutely refractory to internal treatment, though some, and often considerable advantage is obtained by improving the general health by the judicious administration of cod-liver oil, iodine preparations (iodine, the iodides of starch or potassium or iron, iodoform), arsenic and other tonics, proper hygienic and dietetic precautions, and a sojourn at suitable sea-side or other localities, or at some ferruginous, sulphur, arsenical, or salt spa.

Local treatment alone promises a radical cure, and this can usually be effected. The infective nature of the disease must be borne in mind, because after the larger areas of infiltration have been removed or destroyed there may still remain in the surrounding tissues centres where the virus is active, and hence relapses are the rule.

Caustics.—The majority of these agents are very difficult to regulate and effect either too much destruction or too little. Caustic potash (Potassa fusa, Vienna paste), arsenical paste, lactic acid, carbolic acid, and acid nitrate of mercury may be tried, but the one most recently in request is a 10 per cent. ointment of pyrogalllic acid spread on linen and renewed twice daily for three days. This is said to have a selective action on the lupus tissue.

Nitrate of silver or chloride of zinc pencils can be used to bore out the lupus nodules, and their destructive action is mainly mechanical. This method of treatment is now but little employed.

Extirpation or excision is only applicable in certain sites where the lupus is very limited in extent, and even then is not a certain means, and leaves bad scars. The same may be said for the *thermo*—or *electro*—or *actual cautery*, except that these agents are exceedingly useful when the disease is situated upon a mucous membrane.

The injection of fluids, such as iodized glycerin lactic acid, iodoform &c., into

the nodules has been practised with some success.

Scraping and Scarification.—The nodules may be scraped away or removed by the use of spoons of various sizes and shapes, or by double-threaded screws. By this method only the friable lupus tissue is removed and good scars are produced. Still better results are attainable by the destruction of the neoplasm by multiple stabbings or linear scarifications, operations which should be repeated in various directions at different sittings till a scar forms. In any case it is essential to destroy every vestige of the disease. Sometimes it is advisable to supplement this treatment by the application after each operation of a caustic, such as one composed of equal parts of chloride of zinc and alcohol. The wounds may be dressed on ordinary surgical principles, but iodoform is believed by some to have a special action upon lupus tissue.

Unna has introduced *plaster mulls* which contain various definite proportions of salicylic acid and creosote. These are applied night and morning till the neoplasm is destroyed.

Besnier strongly recommends a fragmentary punctiform or linear cauterization with a thermo—or galvano—apparatus, with which he claims to have obtained excellent results (for his method and apparatus see *Ann. de Derm. et de Syph.*, Nos. 7 and 8, 1883).

T. COLCOTT FOX.

LUPUS ERYTHEMATOSUS.—

An affection of the skin, probably of an inflammatory nature, usually limited to the superficial portion of the cutis, and characterized by the evolution on certain definite elective sites of symmetrical erythematous-like macules, which tend to persist, spread peripherally, and leave, without antecedent ulceration, smooth superficial cicatrices.

There are two views with regard to the nature of this disorder—the one, that it is allied to ordinary lupus, that typical cases of each are connected by a series of intermediate links, and that the former may pass into the latter; the other view, which is more generally held, being that *L. erythematosus* has no relation to ordinary lupus beyond an occasional close resemblance in aspect.

Symptoms.—The eruption ordinarily commences by the appearance of smooth, slightly elevated macules, from a pin's head to a lentil in size, which disappear on pressure, and resemble a patch of

erythema, seborrhœa or psoriasis. They spread peripherally, with a distinctly limited border, are usually very persistent, feel a little thickened, and undergo atrophic changes in the older central parts, which result in the formation of a delicate scar.

The surface is sometimes dotted with dilated sebaceous follicles, which may contain comedones. There is no tendency to suppuration or ulceration, though the patches may now and again show signs of secondary inflammation.

The course of the disease may be very chronic or more or less acute, and is marked by the increase of the "primary eruptive spots" to the size of a shilling or half-a-crown, and the evolution of fresh macules, which tend to coalesce, especially over the nose and cheeks, where they form the so-called "butterfly" configuration.

The sites chiefly affected are the nose, cheeks, ears, scalp, fingers, eyelids and lips. On the scalp and ears the atrophic feature is very prominent, and in hairy regions there is a total destruction of hairs. Sir Erasmus Wilson first pointed out that chilblains are prone to form on the nose, fingers and ears, and that, though for a time apparently simple in nature, they may acquire the characters of *L. erythematosus*. The disease tends to symmetry, though it may remain asymmetrical for many months, or years. Such is the phase known as *L. erythematosus discoides*.

Kaposi has also described another variety, which is very rare in this country, and is only known here in its milder forms, the lupus-psoriasis of Hutchinson.

This form, *L. erythematosus disseminatus v. aggregatus*, is characterized by a wider diffusion of the eruptions, an extension by repeated outbreaks, and by the fact that the patches never coalesce. In some cases the whole surface may be dotted over. Its spread is usually chronic, but Kaposi describes an acute febrile and very grave form, accompanied by a typhoid condition. The eruptions may be vesicular or pustular, and the subcutaneous tissue may be involved, giving rise to doughy swellings.

Diagnosis.—At an early period of the evolution of the disease a patch may look very innocent, and simulate erythema, seborrhœa or tinea circinata. Its persistence, and any implication of the sebaceous glands, will, however, excite suspicion, which subsequent observation, and the formation of scarring, will confirm. On the face, old-standing patches

where the deeper layers of the cutis are involved, will simulate exfoliating lupus vulgaris. The diagnosis will be sometimes very difficult unless the mode of development or extension of a patch can be watched, but in lupus erythematosus there will be no small stellate, semi-translucent, brownish-red, soft granules and nodules. On the scalp the atrophic scarring is very characteristic, but it is seen to be associated with an erythematosus condition. On the fingers and the tip of the nose chilblains are simulated, but attentive examination will ultimately disclose the scarring and scaling. The disseminated form, in this country, may closely simulate psoriasis, but is distinguished from it by the presence of scarring.

Pathology.—The diseased condition commences in the corium, generally in the papillary layer (rarely in the deeper or subcutaneous connective tissue), by dilatation of the blood-vessels, and stasis of the blood, changes which are followed by considerable cell infiltration and fluid exudation into the periphery, forming the circumscribed morbid product. Fatty and hyaloid degeneration ensue in the cells, and a cicatrix is formed. The process is very prone to pick out the vascular plexuses about the follicles. It is to be observed that there is not the same tendency as in lupus vulgaris to the formation of cell-nests and giant cells, and no micro-organisms have been found.

Etiology.—This is very obscure. It is not contagious, and not hereditary. *L. erythematosus* is much less frequently met with than ordinary lupus. Females are much more often affected than males, and the age at which it occurs is somewhere between twenty and forty years. It has no effect on the general health except in the malignant cases. Many sufferers are anæmic or debilitated, or belong to tuberculous families. All congestive conditions of the skin appear to predispose to it.

Treatment.—Internal treatment cannot be relied on to cure the disease, but success has been reported from the use of arsenic, phosphorus, iodide of potassium and iodide of starch. No effort, however, should be spared to place the general health on as satisfactory a footing as possible.

All local exposure to extremes of heat and cold should be avoided. In the selection of local treatment minute regard must be had to the condition of the patches, whether actively congested and inclined to spread, or chronic and

quiescent, the depth to which the skin is affected, and the site of the lesion.

If active and angry-looking, soothing measures, such as calamine or weak lead lotion or zinc ointments, are called for; if chronic and quiescent, the following plans of treatment may be tried:—Constriction by contractile collodion, and the application of strong astringents, such as nitrate-of-silver solution or liquor plumbi by means of a camel's-hair brush. Stimulants of various degrees of strength, up to those verging on caustics, are much in vogue. For superficial forms, Dühring recommends sulphide-of-zinc lotion (sulphate of zinc, sulphuret of potassium, aa gr. xxx , alcohol ʒij , rose-water ʒiijss), increasing the strength if well borne. Weak tarry ointments, if used, should be long continued. Liveing advises the use of a 3 to 5 per cent. oleate of mercury. Daily frictions with flannel dipped in Hebra's spiritus saponatus kalinus (2 parts of soft soap in 1 of methylated spirit), to which tar may be added, is often very beneficial, especially if soothing applications, such as ung. plumbi vaselinum, be used in the daytime. There are also various kinds of absorbent and stimulating plasters in use, such as emplastrum hydrargyri, the French sparadrap rouge (diachylon plaster 26 parts, red oxide of lead $2\frac{1}{2}$ parts, cinnabar $1\frac{1}{2}$ part). To do good they must be persisted in, but the length of time over which they should be continuously used must be carefully determined by observation. The pyrogallic and iodoform plaster mulls (Unna's) are stronger, and require only an application of several days. As caustics, collodion of mercurial sublimate, ethylate of sodium, caustic potash (equal parts, or 1 to 2 of distilled water), the strong iodine preparations, and the still more powerful chloracetic acid and the acid nitrate of mercury, are all of service in suitable cases. Before scarification was introduced, Veiel obtained the best results from blistering, with subsequent removal of the thick coating, then painting with equal parts of chloride of zinc and alcohol, removal of the crusts on the third or fourth day, and the application of progressively weaker solutions of the chloride of zinc. This treatment may be repeated if necessary. Lassar lightly brushes over the surface with a Paquelin's cautery at a dull heat. In recent years the best results have been obtained from linear scarification of the skin. The part having been rendered anæsthetic, the skin is lined superficially with parallel cuts, and

these are crossed. This is best done with Pick's instrument. When the crusts have fallen off, the process is repeated until a delicate scar forms. This operation is specially suitable for patches on the face where the least possible scar is desirable.

T. COLCOTT FOX.

LYMPHADENOMA (Hodgkin's Disease; Lymphadenosis; Malignant Lymphoma; Adenie; Pseudo-leukhæmia; Anæmia Lymphatica).—An affection characterized by a progressive enlargement of lymphatic glands and other lymphoid tissues, with new formation or hyperplasia of such tissue in various viscera, notably the spleen, and with anæmia and emaciation. The first examples of this disease were recorded by Dr. Hodgkin in 1832.

The diversity of opinion respecting its nature and affinities is shown in the numerous synonyms it has received, some of which are given above. Indeed, it seems to bear, on the one hand, relations to malignant growths, and, on the other, to such blood diseases as leucocythæmia and pernicious anæmia, whilst its precise cause is unknown. In aspect and mode of extension it resembles new growths—hence the term "malignant lymphoma;" but there are many cases of lympho-sarcoma, especially those originating in the mediastinal glands, which neither clinically nor pathologically run the course or exhibit the characters of this affection. To signify its more general condition and its analogy with scrofula and tubercle, the term "lymphadenosis" was suggested by Dr. Gowers. Trousseau on similar grounds applied to it the name of "adenie." To differentiate it from leucocythæmia, and especially from "lymphatic leukhæmia," the unfortunate term "pseudo-leukhæmia" has been employed in Germany. But in this country most, if not all, cases of so-called lymphatic leukhæmia are considered to be examples of the disease first described by Hodgkin. A less debatable term is "anæmia lymphatica," which, however, does not wholly express the condition, and it is highly probable that it may be differentiated into more than one variety or type.

Symptoms.—In a disease which presents so many variations the symptomatology is necessarily varied. At the onset the subject may be in comparatively good health, until the appearance of glandular enlargement. Or the earliest symptoms may be those of anæmia—viz., lassitude, debility and emaciation, to-

gether with pyrexia. In such cases the starting-point of the gland affection may be in the internal groups rather than the external. The commonest cases are those where the cervical glands are primarily involved.

In the pronounced disease the symptoms are referable to (1) the mechanical interference due to the enlarged glands, (2) the accompanying anæmia, and (3) the pyrexia.

Thus (1) the cervical tumour may compress the carotid and jugular, leading to cerebral symptoms or to congestion of that side of the head and face. Or the axillary may produce pain and œdema of the upper limb; the mediastinal, by pressure on the trachea or œsophagus, may produce cyanosis, dyspnoea, bronchopneumonia or dysphagia; whilst involvement of the mesenteric and lumbarglands may seriously impair nutrition and produce great emaciation. Or, again, hydrothorax may be caused by pressure on the azygos and bronchial veins; ascites, by pressure on the portal vein in the hilus of the liver; jaundice may accompany the ascites.

(2) The anæmia in some cases is very pronounced, in others by no means marked. An examination of the blood shows manifest diminution in the number of red corpuscles, and often many small, red, spherical corpuscles or microcytes. The relative number of white corpuscles varies; the proportion may be normal, or there may be such an excess as to justify the name "lymphatic leukæmia;" but, as already stated, it is doubtful if this can justify the establishment of a distinct disease. The usual symptoms of anæmia may be present, and a cardiac hæmic bruit is often to be heard. Edema of the feet may sometimes be due to the anæmia present; at other times to pressure of enlarged glands on the iliac veins or vena cava.

(3) The pyrexia forms a marked feature of the affection, and is often of the remittent type, as in tuberculosis. No doubt it accounts for some of the wasting observed in this disease.

There are but few symptoms attributable to the presence of lymphomatous growths or infiltrations of organs. Vomiting may be due to this cause, or more indirectly to pressure on the vagus nerve. Diarrhœa is sometimes marked. Albuminuria is very rare; indeed, the urine is not notably altered. There is some liability to cutaneous eruptions, especially furuncles, and occasionally to lymphomatous growths in the skin.

Pigmentation of the skin simulating the browning of Addison's disease, and attributed to pressure of a glandular mass upon the sympathetic plexuses in the abdomen, has been noted in a case of Sir W. Jenner's and one of Sir G. Paget's. In neither case were the suprarenals involved, although they are sometimes the seat of lymphomatous infiltration, like other organs; but in such cases none of the characteristic symptoms of Addison's disease are present.

Certain intercurrent affections, as pneumonia, pleurisy and pericarditis, may occur in the course of the disease; and a few cases are on record where acute tuberculosis has supervened. The disease terminates by asthenia, or by the involvement of the respiratory passages, or by coma from cerebral congestion; but hæmorrhages are less common than in leucocythæmia or pernicious anæmia.

The *diagnosis* of the disease has to be made from (1) chronic lymphadenitis, (2) tubercular lymphadenitis, (3) lymphosarcoma, and it rests upon the diversity of the seat of the affected glands, the absence of any tubercular history or evidence of tubercular disease elsewhere, the association with an enlarged spleen, anæmia and pyrexia.

Morbid Anatomy.—The essential anatomical change in this disease consists in a hyperplasia of lymphatic glands, which seems to assume infective or malignant qualities. The change at first, and for a long time, may remain localized to one group of glands—more often the cervical—but the axillary, inguinal, mediastinal or abdominal glands may be the starting-point of the affection. In other cases several groups of glands enlarge almost simultaneously.

There are differences also in the type of the glandular lesion. Thus, and this obtains in the majority, the enlarged glands may be smooth, hard, discrete and mobile, the enlargement gradually involving one gland after another. They may remain so throughout the course of the affection, or after a time may become fused into a lobulated mass from adhesion to one another and to surrounding tissues. The cases in which the glands remain firm and discrete run a more chronic course than those in which they are softer and more nearly confluent.

The histological characters of the two types of enlarged glands depend on the greater amount of trabecular and fibroid tissue in the firm variety, which, on section, are of potato-like consistence and aspect and the more abundant cell

formation in the other type, which may infiltrate through the capsules, and present a soft, pinkish, medullary appearance resembling the soft sarcomata.

Other lymphatic tissues are prone to a similar hyperplasia—*e.g.*, the tonsils and adenoid tissue of the pharynx, and the abundant lymphoid tissue in the gastro-intestinal sub-mucosa—leading either to a diffuse infiltration and thickening of the wall of the stomach and intestines, or to marked enlargement of the solitary and agminate follicles, or even to vascular growths which readily ulcerate. The thymus, in some cases, has been observed to be enlarged.

The spleen is, in typical cases, somewhat enlarged, firm, of dark-red colour, but studded throughout with pale-yellowish masses (variously compared to lumps of suet and to hardbake) which consist of the altered (fibrous) Malpighian bodies or of masses of new-formed lymphoid tissue. The trabeculae of the organ are greatly thickened. In some cases, however, the spleen is barely altered from the normal; and in at least one case—marked by leucocythæmia—the spleen had all the characters met with in that disease.

Lymphomatous nodules, firm and yellowish, may be also met with in the kidneys, liver, lungs and other organs. They have been mistaken for tubercle. But it is unusual for either the lymphatic glands or these nodular formations to caseate.

Course.—The disease runs a variable course, often being local, limited and almost stationary for months, and having a duration of three to five years, but there are cases of much more acute nature. The majority have a duration of from one to two years. Sometimes a distinct regression occurs apart from the effects of treatment, and in some there may be considerable subsidence of the gland before death.

Ætiology.—The disease, which in some cases appears to be initiated by irritation—*e.g.*, a lymphadenitis from otorrhœa, eczema or chancre—is more common in early life, although a fair proportion of cases are recorded beyond the age of fifty. It is more frequent in males than in females. Beyond the alleged connection of some cases with local irritation, the causes of the affection are mostly unknown.

Treatment.—Attempts have been made to effect a radical cure of the disease by removal of the glands first implicated, in the hope that further extension may

be checked. Apart from the fact that there are few cases where the affection is so local and limited as to warrant a surgical operation for their removal, the failure of such a measure is often due to the existence of the glandular swelling in internal regions. Indeed, the disease, although often localized at the onset, is eminently a generalized affection, and theoretically as well as practically it is hardly to be arrested by such a measure.

Some good results have been recorded from the administration of arsenic, and also from the injection of liq. arsenicalis into the substance of the enlarged glands, a procedure not entirely free from the risk of setting up severe inflammation. Under the use of arsenic the glandular swellings have been known to almost entirely disappear. The same has been said of phosphorus. But the disease is known to occasionally retrogress spontaneously and then again to develop, so that some caution is necessary in accepting these statements. Arsenic, which is the only drug known to have any pronounced effect in pernicious anæmia, and has also been used with advantage in leucocythæmia, does, however, seem to exert in some cases of Hodgkin's disease almost a specific influence. Iodide of potassium, iron, cod-liver oil, strychnine and other tonics may be given.

SIDNEY COUPLAND.

LYMPHATIC DISEASES OF THE SKIN.—Under this title certain rare forms of skin disease may be considered which are essentially of lymphatic origin and are not known by familiar clinical names, as in the case of ELEPHANTIASIS (*q.v.*).

Lymphangioma Circumscriptum (Lymphangiectodes, Lupus lymphaticus of Hutchinson) was first described by Sydney Jones in 1874, subsequently by Tilbury and Colcott Fox in 1879, and, of the remaining ten cases on record, all but two have been described by Englishmen.

The disease is always first observed in early life, although it is not proved ever to be congenital. The lesions consist of vesicles, connected with lymphatics from which albuminous fluid containing a few lymph-cells exudes on puncture, closely aggregated together to form patches. These vesicles are of straw-yellow colour, deeply situated in the skin, their walls thick and tense; sometimes they are intimately intermingled with dilated capillaries and papillary hypertrophy, so that the composite

patches assume a very vascular and warty appearance, which may mask the nature of the fundamental lesion. There may be one or numerous clustered patches, and their commonest seats are the shoulders, trunk, face, neck, back, thighs and arms. The disease causes no subjective symptoms; it tends to spread gradually by the formation of fresh vesicles at the periphery, and to recur after destruction by caustics or removal with the knife. Nothing positive is known of its etiology. Its lymphatic nature is proved by the microscopic researches of Sangster, who describes flask-shaped spaces in the papillary layer, and smaller, more regular spaces in the deeper layers of the corium, the former being due to rupture, the latter to dilatation of lymphatic channels.

Treatment.—Electrolysis applied in a manner similar to that for the destruction of superfluous hairs seems the method of treatment most likely to be useful, and one good result is reported by Crocker.

Lymphangioma Tuberosum Multiplex is a still rarer condition, of which but three cases are on record, the first by Kaposi. The disease is probably congenital. The lesions consist of large, brownish-red papules or tubercles, the size of a lentil, not in groups or clusters, but scattered indiscriminately over the trunk. They dip down into the subcutaneous tissue, and both feel and look solid, but on section they prove to be made up of much dilated lymphatics.

A diffuse general lymphatic dilatation, causing *erythrodermia*, and accompanied by swellings of lymphatic glands, may be the precursor or represent the first stage of some cases of **GRANULOMA FUNGIFORME** (*q.v.*), and a localized ectasia of lymphatics, generally unsuspected, enters into the constitution of many *naevoid*, telangiectatic and warty growths.

J. J. PRINGLE.

LYMPHATIC SYSTEM, DISEASES OF.—Although the above heading should include all diseases of the absorbent system, yet it has been found more convenient to describe several of the affections under distinct titles, owing to their having more or less sharply defined characters. The most important of these are: Erysipelas, gangrene, elephantiasis, leucocythæmia, lymphadenoma, phlegmasia dolens, lymphangioma of the skin, scrofula, tubercle, glanders, and syphilis.

The absorbent system is divided into three parts:—(1) Absorbent surfaces, which include the serous surfaces of the different cavities of the body, the skin and mucous membranes, and intercellular interstices, particularly of the connective tissues; (2) the whole of the lacteal and lymphatic vessels; (3) the lymphatic glands and other masses of lymphoid tissue.

In consequence of the universal distribution of the system throughout the body, it is liable to be affected by a very large number of morbid conditions, and, though any one part may be alone involved, there is a tendency for two or all to be so.

Most of the diseases of the lymphatic system commence locally, but they are liable to spread to a greater or less extent throughout the whole.

ACUTE INFLAMMATION presents itself under three forms—(1) of the vessels alone; (2) of the glands alone; (3) where both are involved.

(1) **Lymphangitis.**—If only the smallest vessels near the point of irritation be affected, the part is red, and the small lymphatics appear as fine wavy red lines, and the condition is spoken of as Reticular Lymphangitis. If the larger trunk be inflamed, the condition is spoken of as Lymphangitis simply.

Symptoms.—There is tenderness of the affected part and along the course of the vessels, often accompanied by pain, which has usually a throbbing character. The position of the vessels, if superficial, is often marked by red lines in the skin, and they can occasionally be felt as fine cords just beneath the skin. There is some swelling of the surrounding tissues, and, if the vessels be obstructed, œdema of the part supervenes, which becomes, in consequence, peculiarly tense and swollen, and the pitting usually produced by pressure on œdematous parts is difficult to obtain (lymphatic œdema).

Pathology and Morbid Anatomy.—The larger vessels, when exposed, are seen to be swollen, often irregularly so, and red, with, perhaps, some thickening of the connective tissues around. If a vessel in this condition be laid open, the contained lymph will be found coagulated and adherent to the lining endothelium, which is irregular, proliferated in some parts and destroyed in others. The rest of the wall is thickened with an increased number of round cells. Under the microscope, micro-organisms can frequently be demonstrated in the coagulated lymph and in the endothelial cells.

The inflammation may either subside or the vessel may become occluded by organization of the clot, or the clot may suppurate and the pus escape into the system, either along the lymphatic vessels and so into the general circulation, or inflammation may occur in the tissues surrounding the vessel, leading to local suppuration, and in either of these ways general septic infection may result.

(2) **Acute Inflammation of the Glands (Adenitis).**—An irritant may traverse the vessels without injuring them and become lodged in a gland, which is generally the first one met with.

The first evidence of inflammation of a gland is its enlargement and induration; it is usually tender. The gland is at first freely movable beneath the skin, and may continue so. The enlargement is due to blocking of the sieve-channels by leucocytes, followed by multiplication of the parenchymatous and connective tissues of the gland. If the inflammation continue the surrounding tissues become adherent, so that the gland is no longer movable. From this point subsidence may occur and the gland return to its natural size; it will contain, however, an increased quantity of connective tissue; or suppuration may supervene. This commences in the centre of the gland, where an abscess forms; the overlying skin becomes red and œdematous, and finally the abscess discharges, unless the pus has been liberated by operative interference.

As the distance of the gland from the original point of irritation is in many instances considerable, as, for instance, when a femoral gland becomes enlarged from suppuration under a toenail, it is customary to speak of the inflammation of the gland as sympathetic, and as the term "*bubo*" (*βυβών*, the groin) has been inaccurately applied to any acutely inflamed or suppurating gland, such a swelling is sometimes termed a "*sympathetic bubo*." Suppuration of the parotid gland is thus termed "*parotid bubo*." The word *bubo*, when unqualified, signifies a swelling of an inguinal gland secondary to venereal disease.

Although the gland nearest to the source of irritation is the most liable to be affected, yet not uncommonly several, even a whole chain of glands, may become inflamed.

When a gland has been enlarged by irritation, but has not suppurated, the enlargement, as soon as the irritant is

removed, generally quickly subsides, but occasionally it continues for a long time. This is due to the inflammatory products having become organized from a formation of fibroid tissue. Contraction slowly ensues, and the size of the gland is reduced, occasionally to less than its normal dimensions.

Ætiology.—Acute inflammation of lymphatic vessels and of glands originates from some source of irritation within or without the body.

From within—from inflammation of internal absorbent surfaces, as mucous or serous membranes, joints, bones; from without—from wounds, burns, scalds and friction.

The immediate cause, however, is the entrance into the vessels of an irritant such as micro-organisms or cells from malignant growths.

In the vessels, micro-organisms, and particularly micrococci, can often be demonstrated in the clotted lymph or in the endothelial cells. It is very rare to find bacilli in the vessels, though tubercular deposits, containing tubercle bacilli, have been found in the thoracic duct.

In the glands, micro-organisms, both micrococci and bacilli, are frequently found, as also are cells derived from a malignant growth. If micrococci be present they are nearly always of the staphylococcus forms, and, as a rule, suppuration follows. The bacilli found in glands are generally those of the specific diseases, *e.g.*, tubercle, syphilis or glanders. Malignant cells also correspond to those of the original disease, whether carcinoma or sarcoma.

Treatment.—The first point is if possible, to remove the exciting cause. The affected part must be kept at rest, and poultices or fomentations, with or without belladonna, opium or other anodyne, should be assiduously applied.

If suppuration have occurred, the pus should be let out by free incision, and in the case of glands, the ragged glandular wall of the abscess should be scraped out. During the pyrexial stage, some febrifuge drug, as citrate of potash, should be given, and free action of the bowels maintained. After the occurrence of suppuration, cod-liver oil, quinine, and port wine are of great use. Residence in a dry, bracing air, is an essential adjunct to the treatment of glandular diseases.

CHRONIC INFLAMMATION.—The lymphatic glands are liable to various forms of chronic inflammatory change, and

such lesions constitute a prominent feature in the morbid anatomy of the various diseases mentioned at the begin-

ning of this article. Reference may be made to those headings for further information.
F. G. PENROSE.

M

MADURA FOOT (Fungus Foot of India; Mycetoma).—A rare affection of the foot, or more seldom of the hand, endemic in certain parts of India.

Symptoms.—The disease first shows itself in the form of small erythematous patches, or of pustules or tubercles, the exact nature of which cannot be accurately diagnosed. Soon more diffuse swelling and induration occur, and boil-like lesions, either superficial or deep, ensue. These suppurate, rupture and discharge ordinary pus, which, in the majority of cases, soon becomes blackish in colour from the presence in it of dark, granular matter, like poppy seed ("black fungus foot"). As the disease progresses in extent and depth, the affected part becomes studded with wart-like mammillary projections, at the bottom of each of which there is a discharging orifice, enormously swollen and disfigured, riddled with sinuses in all directions and totally disorganized, bones and fibrous tissue being generally absorbed, and soft parts thickened and infiltrated. The sinuses are lined by distinct membrane, and contain characteristic "fish-rope-like" particles of a white, yellowish, reddish, or blackish colour.

The disease is much commoner in men than in women, and almost always occurs in adults. It attacks only natives, and preferably those who work with bare feet. Very rarely, the shoulders and scrotum are affected, similarly to the hands and feet. The rate of progress of the disease is very variable, cases lasting from three to thirty years. The result is always lethal, unless the patient die from intercurrent disease.

Nothing definite is known of its *etiology*, although there is every probability of its being of microbic, parasitic origin. The "fish-rope" bodies are mainly composed of fatty and caseous matters, the results of decomposition, encrusted with salts and blood pigment. The fungus (*Chionomyces Carteri*) found in the black, poppy-seed-like bodies is now universally considered to be accidental, not essential.

Treatment.—In the earlier stages the growth may be removed by scraping or excision. In the later stages, when the

limb has become a burden to the patient, amputation, wide of the disease, is the only resource.
J. J. PRINGLE.

MALARIA.—A term applied to the miasm which produces the malarial fevers.

Malaria is most frequently observed as an emanation from marshes, and has hence been called marsh-miasm, and the fevers which it produces paludal fevers. Low, moist, warm localities, and the late summer or autumn produce the miasm in its most virulent form. This is explained by the observation that the miasm only develops when the mean air temperature has been 59° or 60° F. for about three weeks, and by the fact that the flooding of a marsh by heavy rains diminishes malaria. Marshes which are regularly covered by the sea, or which consist chiefly of peat, are seldom malarious. Malaria may be carried for considerable distances by winds, but an expanse of water tends to limit this extension, and even a river may afford considerable protection. A belt of trees also has a similar effect, while the planting of quick growing trees, such as the *Eucalyptus globulus*, exercises a beneficial influence, partly by drying the soil, and partly by regulating the rainfall and distributing it more evenly through the year. Except under peculiarly favourable topographical conditions, malaria does not extend far into a hilly country; even a few feet sometimes make all the difference between a healthy and an unhealthy site. The early morning and late evening hours are especially dangerous, as is sleeping in tents or on the level ground in a malarious locality.

The conditions of soil under which malaria arises may be thus summarized: (1) alluvial soils in deltas, or old estuaries which are silting up, especially if occasionally overflowed by the sea; (2) old water-courses and partially drained lakes, and sandy plains with a clay or marl subsoil—a condition often found in old river beds; (3) at the foot of hills in the Tropics where the soil is full of vegetable matter, and is imperfectly cultivated; (4) in the lower chalk formations, especially if the subsoil be

clay or marl; (5) weathered granitic or trap rocks containing much vegetable matter (fungi, &c.). Rocks in this condition absorb and retain much moisture. To these main conditions are to be added (6) soils recently cleared of forest or brush and not completely brought under cultivation, and also when soils have been deeply turned up, as in making canals or railways; (7) where tracts of rich land have been allowed to fall out of cultivation. Finally, it must be observed that on board ship outbreaks have occurred which could not be traced either to previous infection ashore or to the drinking of water obtained in malarious localities, and must be attributed to the development of the miasm from the foul bilge-water in an ill-ventilated ship.

On the other hand, malaria tends to disappear as a country is drained and brought under systematic cultivation; it has thus disappeared within the last century from Scotland, almost disappeared from England and Ireland, and has greatly decreased in the New England States.

As may be inferred from the above statements, the diseases produced by malaria are, as a rule, endemic; occasionally a great prevalence in an endemic area is followed or accompanied by an epidemic prevalence in neighbouring tracts of country; more rarely pandemics occur, four such having been noted during the present century.

A consideration of all the circumstances have led the majority of observers to the conclusion that the malarial poison is a living organism. Various attempts have been made to identify this organism, and at the present time two diverse views are entertained. This subject is further dealt with in discussing the pathology of the intermittent form of malarial fever.

DAWSON WILLIAMS.

MALARIAL FEVER (Ague; Intermittent Fever; Remittent Fever).—An acute, non-contagious, specific disorder, produced by a miasm, generally air-borne, originating under certain conditions of soil and climate (*see* MALARIA).

The symptoms of malarial fever vary very greatly, and many subdivisions have been made; in a well-marked case of intermittent fever, or ague, a febrile paroxysm occurs daily, or at longer intervals, the temperature in the intervals being normal and the patient free from any symptoms. In other types (remittent)

the pyrexia is continuous, but presents more or less marked remissions.

Intermittent Fever (Ague).—*Prodromal Symptoms.*—Lassitude, pains in the limbs, and anorexia, or nausea, are sometimes present.

Phenomena of the Ague Fit.—The actual ague fit, whether preceded by these symptoms or not, sets in abruptly; weariness, epigastric discomfort, headache and giddiness are quickly succeeded by severe shivering.

Cold Stage.—The surface is cold, the features pinched, the tongue pale and dry, nausea may be distressing and accompanied by vomiting; the pulse and respiration are quick and often irregular.

Hot Stage.—This, after a varying period succeeds; the surface becomes gradually red and warm, the face flushed, the eyes injected, the pulse full and bounding, the respiration deep and frequent. The headache, which was complained of at the commencement of the cold stage, acquires a throbbing character, and is more distressing.

Sweating Stage.—This gradually replaces the hot stage. The flushed skin is now moist, and perspiration quickly becomes very profuse; coincidentally all the general symptoms subside, and the patient is left free from pain or fever, but probably somewhat exhausted.

The body temperature (as ascertained by a thermometer placed in the mouth or rectum) begins to rise before the cold stage, and as the rigor becomes well developed the temperature rises as much as 4° F. or 5° F. in the course of an hour. It continues to rise all through the hot stage, eventually reaching 105° F. to 107° F. or even higher, but when the sweating stage has set in, or a little later, it begins to fall as rapidly as it rose, finally dropping 1° F. or 2° F. below the normal.

The duration of each paroxysm varies from two to twelve hours; as a rule the more severe the disease, the longer the paroxysm; the cold stage may last for several hours, for a few minutes, or may be so short and slight as to pass unnoticed by the patient; the hot stage lasts from three to eight hours, but may be much shorter and is occasionally not to be observed, the sweating immediately, or almost immediately, succeeding the cold stage.

The urine undergoes a parallel series of changes; the amount of urea and water is increased from the time the temperature begins to rise, that is, a little before the cold stage develops, and re-

mains in excess until the temperature falls at the commencement of the sweating stage. During the sweating stage the quantity of urates and of chloride of sodium is increased, and albumen or blood may be occasionally found.

The period which elapses between the end of one paroxysm and the beginning of another is termed the *intermission*; that between the beginning of one paroxysm and the beginning of another, the *interval*. In any given case the intervals are generally about equal, often exactly so. The commonest interval is one day, the paroxysm commencing at the same hour daily; this is the *Quotidian* type, which generally has a short cold stage and a relatively long hot stage, the whole paroxysm lasting eight to ten hours. The next most usual type, and that which is perhaps oftenest seen in temperate climates, is the *Tertian*, in which the paroxysms occur every other day; it has a long cold stage, and a relatively short hot stage, the whole lasting six to eight hours. Occasionally cases are met with—generally in patients who have contracted the disease in the autumn in a temperate climate—in which there are two entire days between the paroxysms, which begin on the fourth day; this is the *Quartan* type, which generally has a short paroxysm with a relatively long cold stage, and is reputed to be very obstinate.

A somewhat complicated terminology has survived from the writings of the Roman physicians, to describe cases in which the paroxysms occur at other intervals; thus, in a "double tertian," there is a paroxysm daily, but the hour of onset and other characters of the paroxysms on alternate days correspond. There may be a double quartan, the two series being thus combined:—Days 1. 2. 4. 5. 7. 8. Celsus described a "semi-tertian" which would really appear to be a combination of the quotidian and tertian, the patient having two paroxysms on one day and one on the next. In practice, however, it is neither easy nor necessary to employ these terms in a large proportion of cases, and it appears certain that many slight cases occur in which the intervals seem to be much longer, either because the intermission is really prolonged, or because some of the paroxysms are very slight. In fact, as a case grows milder the interval lengthens, the disease being said to "postpone;" thus a postponing quotidian becomes a tertian. Conversely, if the case becomes more severe the parox-

ysms occur at shorter intervals, and the fever is said to "anticipate;" thus an anticipating tertian becomes a quotidian. After apparent recovery *relapses* are very frequent, and in time a condition of malarial cachexia may become established.

The most frequent and important *complication* of intermittent fever is pneumonia; consolidation occurs very rapidly, frequently affects both lungs, and seems to be determined by a sudden transference to a cold climate. In persons who have previously suffered from bronchitis, dysentery, diarrhoea, asthma, or epilepsy, these diseases may reappear. It has, however, sometimes been observed that epilepsy has disappeared on the onset of ague.

The *diagnosis* of well-marked intermittent fever is generally easy, the regular sequence of the three stages, the sudden rise and fall of the temperature, the urinary changes, the enlargement of the spleen, the history of exposure, and the effect of quinine, combining to form a very characteristic group of phenomena. In relapses, the history of previous attacks will serve as a guide. Hectic fever, due to phthisis or other chronic suppuration, has been confounded with ague, as have also pyæmia and ulcerative endocarditis; careful physical examination ought to prevent such errors.

The *prognosis* is generally good, the direct mortality being very low. During the Civil War in the United States over seven hundred thousand cases of intermittent fever were treated, the mortality being in quotidian, 1.047 per mille; in tertian, 1.007 per mille, and in quartan, 2.245 per mille. In making a prognosis, the influence of complications has chiefly to be considered, and the special liability to pneumonia must be borne in mind.

Some points in the *pathology* of intermittent fever have already been considered in the article on *MALARIA*. The chief morbid changes are those observed in the blood and spleen. The spleen is enlarged, soft, and easily ruptured; the liver is congested, pigmented, and in cases of some standing enlarged from overgrowth of connective tissue. The myocardium is soft, and pale or yellowish. The blood is profoundly affected: the red corpuscles are diminished in number, and do not run so readily into rouleaux, the white corpuscles are increased, the serum is stained a brown colour, and the coagulum is loose, friable, and dirty red; the blood, as a whole, has a dark colour. The *bacillus malarie*,

found by Klebs and Crudeli in the air and mud of the Pontine Marshes, is said by them to produce remittent fever in dogs and rabbits with enlargement of the spleen, the organism being discoverable in the spleen and medulla of bones. The bacillus is said to be present in the blood of human patients, but only during the period of invasion. A minute hæmatozoon, provisionally named *hæmatomonas malarie*, has been found (Laveran, Richard, Osler) associated with malaria in a large proportion of the cases examined. In a case which has not been treated, if the blood be examined before the paroxysms, a large proportion of the red blood-corpuscles are seen to contain minute hyaline bodies in which pigment granules are included; these pigmented bodies increase in size until the cell is filled; a process of segmentation then occurs, and the cell wall breaks down leaving the segments free. Each segment or spore is oval and contains a pigment granule or granules. It is believed that the adult form, which is always free, is derived directly from these spores; it is a rounded or oval body, a little smaller than a red corpuscle, containing pigment granules, and possessing one, two, or three mobile flagella. The process of segmentation appears to coincide with the onset and course of the paroxysm; at its conclusion the segmentary bodies within corpuscles are no longer seen, though abundant at its commencement. The administration of quinine is followed by the immediate disappearance of the intra-cellular forms above described. In their place are found, in many cases, crescent-shaped bodies, consisting of a hyaline material, including granular pigment. The length of these bodies is about double the diameter of a red blood corpuscle. They are believed to be the resting form of the organism, and are met with in cases which have been under treatment and in chronic cases. Whichever of these series of observations may eventually turn out to be the more correct—and the evidence with regard to the *hæmatomonas* appears to be by far stronger than that advanced by the discoverers of the bacillus—the important clinical fact is that the malarial poison is capable of producing with extraordinary rapidity the most profound anæmia, inasmuch that severe dropsy may quickly supervene, and the patient may even succumb to an attack of œdema of the larynx.

Treatment during the paroxysm must, in the main, be limited to relieving the more distressing symptoms. During the

cold stage the patient's desire for warm covering should be gratified, and if this stage be prolonged the onset of the hot stage may be favoured by warm drinks (e.g., tea). The emptying of the stomach by emesis, which is generally considered advantageous, is thereby facilitated. Severe neuralgia is an indication for a small dose of morphine administered hypodermically. The routine use of purgatives during the prodromal or early paroxysmal stages is generally condemned, but the great traveller, Dr. Livingstone, whose experience was very large, strongly recommended their use in the prodromal stage. (His "rousters" were thus compounded:—*Jalapæ resinæ*, pulv. *rhei*, āā gr. vj , *hydrargyri subchloridi*, *quininæ sulph.*, āā gr. iv .)

If the tongue be furred, the skin sallow, and the bowels constipated, mild purgatives should be administered during the hot stage, as otherwise the quinine to be subsequently given may be rejected. Special caution must be used when the patient is much debilitated, or there is a previous history of diarrhœa or dysentery.

Advantage must be taken of the intermission to administer quinine. Not less than 20 grains should be given during the interval. This quantity may be given in two equal doses, one at the end of the sweating stage, and the other about five hours later; others prefer to give 3 or 4 grains every hour until the desired quantity is exhibited, believing that thus absorption is better assured. If there be purgation or much irritability, laudanum in doses of 7 or 8 minims may be combined with the quinine. If there be obstinate vomiting, the quinine must be administered by enema, or, in very urgent cases, by hypodermic injection; but if an irritating solution be used, ulceration may be produced, and in a few cases tetanus has been observed to follow. The best salt for the purpose is that known as the acid hydrobromate; gr. j dissolves in ℥vj water. The acid hydrochlorate is soluble in the same proportion; the dose of each is gr. $\frac{1}{2}$ – ij .

The temperature ought to be watched systematically for several weeks, and as long as any periodic elevations are to be detected quinine should be taken daily to the amount of about 10 grains. On the appearance of prodromal symptoms, 10 or 15 grains should be taken in a single dose. The remaining anæmia should be combated by arsenic and iron. In cases where quinine in doses sufficiently large to produce toxic symptoms fails to prevent the re-

currence of modified paroxysms, arsenic, either alone or in combination with the quinine, is sometimes found to succeed. The following prescription is recommended by Dr. Bemiss:—*Ferri redacti gr. xl, acidi arseniosi gr. j, quiniæ sulph. gr. xl, ol. pip. nigr. gr. x; M., ft. pil. No. xx.* Sig. One pill three times a day. Warburg's tincture, which contains quinine in combination with numerous aromatic drugs, is a powerful remedy. The bowels having been opened, half an ounce is given, all other fluids being withheld; the dose is repeated in three hours. It is a powerful sudorific, and this action, beneficial as a rule, renders it a somewhat dangerous remedy in patients exhausted by disease. Chloroform in large doses, as much as 1 drachm, given at the commencement of the paroxysm, either alone and immediately followed by water or suspended in mucilage, sometimes arrests it and produces refreshing sleep. Small doses (mʒij to ℥x) of nitric acid four or six times a day are also said to be of great use in some cases, and may be easily combined with quinine. Other alkaloids of cinchona, and "cinchona alkaloid," prepared by a cheap process and containing all the alkaloids, were formerly recommended as substitutes for quinine on the score of economy, but the price of quinine is now very moderate.

The administration of pilocarpine at or shortly before the beginning of the paroxysm has been observed to prevent or arrest the attack, and in some cases no recurrence has taken place. The salt used has been the hydrochlorate; the dose by the mouth is gr. $\frac{1}{4}$, but the drug is better given hypodermically, the dose being gr. $\frac{1}{4}$ dissolved in water ℥x. The alkaline sulphites, carbonic acid, biberine, various preparations of eucalyptus and numerous other drugs have been praised by some, but when tested by others have not yielded satisfactory results.

Remittent Fever.—A severe type of malarial fever exhibiting periodic oscillations of temperature of the same character as those observed in intermittent fever, but without complete deferrescence.

The factors determining the occurrence of malarial fever of this severe type are—(1) a virulent form of malaria; (2) new arrival in a malarious district, especially if combined with exposure to a hot sun, or with alcoholic excesses; (3) personal idiosyncrasy or dyscrasia; (4) want of early treatment of intermit-

tent attacks, and continued exposure to malaria. For the reasons mentioned under (1) and (2), remittent fever is most often observed in the tropics: in India it is commonly known as "jungle fever"; it is peculiarly virulent on the West Coast and tropical interior of Africa; it is frequently seen in Algeria, Italy, and the Southern States of North America.

The *symptoms* bear a general resemblance to those of intermittent fever, but the onset is generally more abrupt, prodromal symptoms may be absent, and the cold stage short and often but slightly marked. As the temperature begins to rise, the patient feels chilly and ill. The hot stage is quickly developed; the face becomes flushed and anxious, and the skin pungently hot to the touch. The tongue is large, with white or yellowish fur and indented edges. There is great epigastric oppression and usually free vomiting, the vomited matters being at first clear, then bile-stained (hence the term "bilious fever" is applied). Hiccough is often distressing. The bowels are, as a rule, constipated, and the motions passed are bile-stained. Jaundice is rare, but a sallow tint, often due to blood degeneration, is generally observed. The urine is acid, scanty, high-coloured, and often bile-stained, and, occasionally during the height of the febrile paroxysms, contains albumen; during the hot stage the urea is increased. The pulse is rapid (120 or more), full and tense. Epistaxis is not infrequent. The nervous system is less profoundly affected than in enteric fever, but there is severe headache with pain in the back and limbs at the onset of the illness, and delirium is frequent at a later stage.

The temperature begins to rise with extreme rapidity during the cold stage, and in the hot stage may reach 105°–107° F., or even to 110° F. The high temperature and the other acute symptoms above described continue unabated for six or twelve hours; then the *remission* occurs. The temperature falls from two to four degrees, the skin becomes moist, the epigastric discomfort and vomiting cease or greatly diminish, and the headache is less severe. After a remission of from two to twelve hours, varying according to the severity of the case, the patient again becomes chilly, and quickly passes into the hot stage; the remission almost invariably occurs in the early morning, the exacerbation at noon or in the afternoon. If the paroxysm be short, there may be a second less well-marked remission in the evening, a second exacerba-

tion before night, and the chief remission in the morning. In severe cases the exacerbations, roughly speaking, last from noon to midnight, the remissions occurring during the early morning hours. The duration of remittent fever is very uncertain; in mild cases it may end in from five to seven days, and in severe cases it may end in death in from seven to ten days. In average cases exacerbation succeeds exacerbation for from twenty to forty days. As improvement occurs, the remissions may be observed to become more marked, until the temperature finally falls to or beyond the normal, the case being in fact converted into one of intermittent fever.

The *diagnosis* of remittent fever is often difficult. It is especially liable to be confounded with enteric fever, and there is no doubt that the belief long entertained, that the latter disease did not occur in India, was due to such confusion. The mode of onset, however, of the two diseases is, as a rule, different, that of enteric being gradual, that of remittent sudden, a difference well evidenced by the characters of the temperature curves. The eruption, iliac gurgling, and peculiar stools of enteric fever are absent in remittent. There seems to be, however, some reason to believe that the course of enteric fever may be materially modified by the co-existence of the malarial poison, and that some at least of the cases described as Typho-malarial Fever (*vide infra*) are to be thus accounted for.

From yellow fever the diagnosis may sometimes be difficult in latitudes where both are met with. It must be borne in mind that yellow fever is a continued fever, without morning remission, and is liable to cause death in three or four days. It tends to spread as an epidemic, and has a very high rate of mortality. In yellow fever hæmorrhage from the mouth, nose, eyes, ears, bowels and kidneys (all or some) is the rule, whereas in remittent fever epistaxis and blood-stained vomit or stools are rare, and hæmaturia is very rare.

The *prognosis* is more serious than in intermittent fever. In the United States army during the War of Secession the mortality among the cases of remittent fever under treatment was 13.45 per thousand. The unfavourable elements in prognosis are a history of alcoholism, marked typhoid symptoms, collapse during remission, a tendency to hæmorrhage, severe offensive diarrhoea, hiccough, or slight and short remissions. The favourable signs are long and distinct remis-

sions, free action of the skin, a tendency for the exacerbation to be less severe, and for the temperature during remission to reach nearer to the normal.

The *morbid anatomy* of remittent fever is greatly modified by the co-existence of the consequences of malarial cachexia. The blood presents to a very marked degree the changes already mentioned under Intermittent Fever; the spleen is always large, congested and pigmented; the liver commonly presents similar changes. Congestion of the gastric and intestinal mucous membrane is present to a greater or less degree.

In the *treatment* of remittent fever the two main indications are to bring the system under the influence of quinine, and to prevent the temperature from reaching a dangerous height. At the onset it will probably be necessary to combine a purgative with the quinine; for this purpose Livingstone's pills (see above), or a combination of calomel, ext. colocynth co. and scammony, about 3 grains of each with a few drops of oil of black pepper, may be given. This may be supplemented or, in cases where purgatives have to be avoided, replaced by lemonade containing bitartrate of potassium. Some physicians wait until the remission occurs before giving quinine in large doses, but with this partial exception all are agreed that there is no contra-indication to its use; scruple doses are given every four hours until three doses at least have been taken; if vomiting prevents retention of the quinine, it must be given by enema, a half-drachm dose repeated once; if this also fails, by hypodermic injection (see above, under Intermittent Fever). Warburg's tincture is highly valued by many physicians, and may be given in the manner described above (*see* Intermittent Fever). During the hot stage, with a view of quieting the pulse and diminishing restlessness, drop doses of tincture of aconite may be given every quarter of an hour until πxij have been taken. Vomiting is best met by a small dose of morphia given with dilute hydrocyanic acid, alone or by hypodermic injection; sucking lumps of ice is a useful adjuvant and is grateful to the patient. At the same time a cold damp towel, sprinkled with chloroform may be placed over the epigastrium. Drop doses of liq. arsenicalis have been recommended. High temperature is best treated by the cold bath. Maclean recommends a bath at 90° F. cooled down to about 85° F., or sponging of the skin with water, the temperature of which is

gradually reduced, as in the case of the bath. Collapse, which is most apt to come on at the beginning of the remission, must be treated with stimulants, of which the best are champagne, brandy with aerated water, and white wine whey.

Pernicious Malarial Fever is a convenient term under which to classify cases of malarial fever, chiefly remittent, presenting aberrant symptoms of a serious character.

In the *Algide*, or *Congestive* form, the patient passes, sometimes quite suddenly, into a condition of stupor from which it is difficult or impossible to arouse him. The surface is cold, livid and often moist, the face pinched, the pulse slow, small and irregular, and the pupils dilated; diarrhoea may be present. This form is extremely fatal. The statistics of the United States Army previously quoted show a mortality among such cases of 239.1 per mille. The treatment of a paroxysm of this type may be commenced by the application of warmth to the surface, or of cold or iced water followed by vigorous rubbing; one-sixth of a grain of morphine combined with one-fiftieth of a grain of atropine should be given by hypodermic injection, or one-fifth of a grain of pilocarpine administered in the same manner. Either morphine or opium may be given by the mouth combined with large doses (ḡi to 3j) of chloroform suspended in mucilage; chloral hydrate is also recommended, especially for rectal injection. Quinine ought also to be given at once—a scruple of the sulphate by the mouth, or half a drachm by the rectum, or 5 grains of the neutral sulphate, by hypodermic injection. The administration of quinine should be continued in doses of 10 to 20 grains (by the mouth) after the paroxysm has passed away, in the hope of arresting the onset of another. Warburg's tincture is also highly recommended in these cases. If the probable length of the intermission be known, the patient should go to bed before the next paroxysm is due, should take hot stimulating drinks, and an extra dose of quinine combined with an opiate. After the first paroxysm, the object should be to induce mild cinchonism and to maintain it until one or more paroxysms have passed.

The *Syncopal* form described by French writers appears to be a variety of the above. The onset is so sudden that the patient may fall while going about his business. As the syncopal condition continues, the faint evidences of organic

life may be overlooked by careless observers, and cases are on record where persons thus affected have been prepared for burial.

In the *Comatose* form the onset of the symptoms is less sudden, the patient complains of throbbing headache, and a sensation of heat and general discomfort, he then becomes drowsy, and finally unconscious, lying motionless with stertorous breathing, a hot turgid yellowish skin, and full bounding pulse. In the treatment the main indication is to give quinine in full doses at once in one or other of the ways above mentioned; a mercurial purge is also generally required, followed by lemonade containing bitartrate of potassium (3j to Oj).

The *Asthenic* or *Adynamic* form occurs in persons debilitated by privation or excesses; vomiting early becomes serious, and the rejected matters are deeply stained (by bile or altered blood). A large proportion of the cases formerly classed under this head are now believed to be examples of enteric fever, perhaps complicated by malaria (Typho-malarial Fever; *vide infra*), or of Mediterranean fever (*q.v.*).

The *Hæmorrhagic* form is comparatively rare and is not a distinct variety. A liability to ecchymosis or to hæmorrhages from the mucous surfaces appears to be developed in some persons long exposed to malaria; the hæmorrhages occur during the chills. As has been already stated, hæmaturia occurs in a certain small proportion of cases. Two varieties of malarial hæmaturia have been described—(a) A mild form following or accompanying intermittent fever, in which the urine sometimes contains hæmoglobin but no corpuscles. It is doubtful whether these cases ought to be distinguished from paroxysmal hæmoglobinuria (*q.v.*). (b) A malignant form characterized by the ordinary symptoms of severe remittent fever; the urine is of a dark red or porter colour, and jaundice is present. The urine contains blood pigment but few blood-corpuscles, and the jaundice is undoubtedly hæmatogenous. In these cases, which form the most typical examples of the hæmorrhagic type, bleeding may also occur from the nose, bowels, or uterus, and the vomited matters contain altered blood. In the treatment of these cases, the administration of quinine must be accompanied by the use of stimulants and easily assimilable foods. The administration of ergot, combined with gallic and sulphuric acids, has been

recommended in the hope of controlling hæmorrhage.

Typho-malarial Fever is a term which has led to much controversy. It does not denote a specific form of disease; the majority of cases are instances of enteric fever occurring in persons who have also been exposed to malaria; others are probably examples of remittent fever with diarrhoea, in which asthenic symptoms are early and severe; others again are probably examples of the fever commonly known as Mediterranean fever (*q.v.*).

Malarial Cachexia is the condition of ill-health produced by continued exposure to malaria. The paroxysms of malarial fever may continue for many weeks or months if untreated. In any case relapses very frequently occur, and this even after removal from the malarial district. Persons residing in such districts, either after suffering from the disease in a well-marked form, or without such an attack, are liable to become subject to latent intermittent fever, the so-called "dumb-ague." The paroxysms are not well developed, but the patient periodically suffers from malaria, loss of appetite, furred tongue and nausea. The temperature rises during the period of indisposition, which is often described by the patient as a bilious attack. The enlargement of the spleen is at first present only during the paroxysms, and is due to congestion, and the organ may then be ruptured by a blow, may rupture spontaneously, or may become the seat of infarcts, leading to suppuraction or even to gangrene. When the disease has become chronic the spleen is permanently enlarged, owing to fibroid overgrowth, producing the typical "ague-cake"; its capsule is thickened, and may be adherent to other organs. The liver undergoes similar changes, though to a less extent. Whether malaria also produces fibroid kidney is doubtful, but in the cases in which the spleen is much enlarged, and there is anasarca, albuminuria is not uncommon.

Anæmia is an early symptom, and may after a few paroxysms of intermittent fever be sufficiently severe to produce extensive anasarca; the skin has a sallow or yellow tint, and the patient has an aged appearance. Patients who are already suffering from malarial anæmia are peculiarly susceptible to scurvy if exposed to causes tending to produce that disease. During the acute attacks also, the serum of the blood may become pigmented from destruction of red cor-

puscles. This probably plays some part in the deep pigmentation of the brain, liver, spleen, and other organs, observed in persons who have died while suffering from malarial cachexia, but to a large extent it is due to the presence of particulate pigment, probably indirectly derived from hæmoglobin, through the intervention of the *hæmatomonas malarie* (*see vide supra*). When melanæmia is well established, the pigment granules may be seen in the white and red corpuscles of the blood, and in the parenchyma of the spleen, liver, osseous medulla, lymphatic glands, and central nervous system, giving these organs a slaty or slaty-brown colour. The existence of the malarial cachexia, or it would seem the mere fact of having at one time suffered from malarial fever, tends to impress a periodic character on many disorders; this has been observed in bronchitis, pneumonia, and many other diseases. Neuralgia, especially of the first division of the fifth nerve, is so common an accompaniment of the malarial cachexia, that the term "brow-ague" is in popular use. The malarial cachexia may be congenital.

In the *treatment* of malarial cachexia, the first indication is to remove the patient from the malarial district; if this involves a journey from a tropical or sub-tropical to a temperate climate, great care is called for, especially as to clothing. The systematic use of Carlsbad and Friedrichshall waters combined, with careful employment of Turkish baths, is to be recommended, but is considered to be less useful than taking the baths and drinking the waters of Carlsbad and Homburg. The anæmia must be combated by iron or arsenic or both combined, as in the pill mentioned in the section on Intermittent Fever. The phosphates of iron, quinine and strychnine are conveniently combined in the *syrupus ferri, quininæ et strychninæ phosphatis* (Easton's syrup), which is a useful remedy. The following prescription is a substitute for this syrup:—Take of phosphate of iron 16 grains, of quinine 12 grains (=sulphate 16 grains), of strychnine $\frac{1}{2}$ grain, of syrupy phosphoric acid 20 drops or q.s. Triturate the strychnine with the phosphate, mix all the ingredients quickly, and divide into sixteen pills (Martindale). In the treatment of enlarged spleen, Maclean recommends the ointment of the biniodide of mercury, a piece the size of a walnut to be rubbed into the skin of the hypochondriac region, and the part exposed to the heat of a

fire until the smarting becomes too severe to be borne; the process should be repeated the same day, and again in a fortnight if necessary. The ointment should contain 13 grains of the biniodide to the ounce of lard—i.e., a little less than the ung. hydrarg. iod. rubr. (B.P.).

DAWSON WILLIAMS.

MALINGERING.—Deliberate shamming is more common amongst prisoners, soldiers and schoolboys than in the community at large. Even where there are good grounds for suspecting that an illness is feigned, great caution should be exercised in giving expression to such suspicion. The best way to detect the malingerer is to appear to believe all his statements, but to keep him under very close observation, when he will probably betray himself, because he does not think that he is being watched. It is often very difficult to distinguish between hysteria and malinger-ing, or to say where the one begins or the other ends.

MANIA.—A form of insanity broadly characterized by exaltation of nervous action, the symptoms being in many respects the direct antipodes of those which obtain in melancholia.

Thus, whilst in melancholia the cardinal characteristics are nervous depression and mental pain, in mania we observe exalted self-feeling, and general nervous excitement. At times but little noticeable, at others strikingly predominant, these are the features which most attract the attention of the onlooker, and appear to be the essential elements of the disease.

A closer examination will, however, show that this excitement is the result, not of excess of nerve force, but of defect of inhibitory power—that the excess of nerve-action in one direction connotes a corresponding failure in another.

The real pathognomonic element, then, in mania—the factor which alone can be said to be common to all cases alike—is *defective inhibition*, in other words *loss of control*.

Symptoms.—An attack of acute mania may begin with considerable abruptness, but it is more usually ushered in by a period of incubation, in which the individual becomes dull, depressed, and apparently self absorbed; this constitutes the so-called “stage of melancholia” which is such a frequent prelude to an attack of mania, and which may last a

variable time—from a few days to a week or two, or more.

The fully developed attack presents considerable variety as regards the grouping and intensity of the symptoms. The patient appears gay and happy, sanguine and confident, and his exuberance of feeling finds expression in general muscular activity. He is ever on the move, pacing up and down the room, dancing about and performing all kinds of antics; his arms are thrown about in various positions, and he assumes all sorts of attitudes.

The facial expression is continually changing, the tongue may be thrust out, the eyeballs rolled about, and grimaces of all kinds indulged in. The fantastic and the scornful, the sublime and the ridiculous, follow one another in quick succession, and are grouped in the most incongruous ways. Loquacity is usually pronounced, and the patient may be singing, shouting and talking, almost incessantly; though there are sometimes interludes of quietude, the chatter is not unfrequently kept up from morning to night with scarcely any intermission, and the patient may be as noisy and talkative at night as he is by day.

His talk, too, presents some interesting features. There is almost always some want of connection between the sentences—in other words, *incoherence* is exhibited; this may be very slight, and evidenced merely by a too rapid transition from one subject to another, or so extreme that even the individual words seem to stand by themselves without apparent connection. It is not, however, to be understood that there is no association of ideas in mania; on the contrary, such association can often be clearly traced, but from the suppression of intermediate links it very generally happens that two sentences are placed in juxtaposition, which are apparently in no way related to each other.

There is not unfrequently a tendency to rhythm in the speech, and actual rhyming is often observed. This may be exhibited merely in the terminations of sentences; or a string of words or syllables, resembling one another in sound, may be repeated in quick succession. It is frequently the case that a word spoken by a bystander is taken up by the patient, and acts as the starting-point of a series of verbal associations of this kind.

The conversation is at times foul and obscene, even in the case of those who, when well, are perfectly correct in the matter of morals.

The behaviour is similarly at times indecent; or it may be aggressive and blustering, and the patient may indulge in coarse and insolent personal remarks at the expense of the bystanders.

The faculty of attention is almost always more or less impaired. In mild cases, indeed, the impairment may be but slight; the patient may readily be got to answer questions, and even to give some account of himself; but in the severe forms he is with difficulty recalled to himself for however short a period, and even if got to answer a question he immediately afterwards resumes his stream of talk without paying any regard to his questioner.

Memory is usually impaired in proportion to the severity of the attack. It is not that no cognizance is taken of surrounding things, but the degree of attention paid to any one object or occurrence is usually so slight that sufficient time is not afforded for a permanent impression to be made. Events are, however, sometimes remembered by patients in a most unexpected manner. Some patients, indeed, recollect clearly all they have gone through, whilst to others the past is as a dream.

The senses are usually active and may be over-acute.

Hallucinations and illusions of the different senses are frequently met with. Hallucinations of sight and hearing are the most common, the patients hearing voices and seeing visions which have no objective existence. It is exceedingly common for patients to mistake the identity of those around them, and to address strangers as familiar acquaintances.

Ideation is active although irregular. Ideas, more or less vague and ill-formed, seem to arise in great numbers in the patient's mind, either simultaneously or in quick succession; his rapid talk is, as it were, a reflex of this, and his very incoherence may in part be due to this cause, one idea being supplanted by another before there is time for the full expression of the first. It is, however, scarcely correct to say that, in an ordinary case of this kind a patient labours under delusions, for his ideas are of too random and fleeting a character to come with strictness under this designation.

Frequently, though by no means constantly, the patient exhibits strong destructive propensities, and will tear his clothes, or his bedding, or destroy any articles of furniture within reach.

As mentioned at the outset, the patient is usually exhilarated and appears in a

general good humour—especially is this the case in the milder forms of the disease; but it is by no means always so; on the contrary, annoyance and anger may predominate, or a state of happiness and contentment may be disturbed by fitful gusts of passion. When this is the case the patient is often violent and dangerous to those around him, especially if, as is generally necessary, his disorderly actions have to be restrained.

In a mild case a patient may be correct in his habits, and conduct himself with a certain amount of propriety, but in proportion as the case becomes severe it is usual for the calls of nature to be unattended to, and for urine and feces to be passed without regard to locality; especially is this the case at night, when it is very common to find the linen wet or soiled unless special precautions are taken.

There is a great tendency in most cases to untidiness and slovenliness of person, and it is very common for patients to remove their clothing and strip themselves naked, if permitted to do so; this practice is resorted to by night as well as by day.

The physical condition of a maniacal patient varies according to the intensity of the attack.

Insomnia is usually marked even in mild cases, whilst in severe cases sleep may be almost totally wanting.

The general sensibility of patients is often much diminished, so that they take no notice of changes of temperature, and appear not to feel injuries or sores of which they would be acutely conscious in health.

The pulse is usually accelerated, and its rapidity is generally proportionate to the degree of muscular activity and the severity of the attack.

The temperature in mild cases may not be raised, but if the case be at all severe it is common to find a rise of one or two degrees, or even more.

The digestive functions are usually disturbed. In a case of any severity the tongue gets thickly loaded with fur, and tends at times to become dry; whilst, if there be much loquacity, ropy saliva accumulates about the corners of the mouth and sordes collect on the teeth. When this condition prevails, the appetite is usually interfered with, and there may be much difficulty in administering food; but in mild cases the patient often takes his food well, at times, indeed, in excess, whilst in the more chronic forms a ravenous appetite is common. The bowels are usually constipated.

In women menstruation is generally arrested—at any rate for a time.

A patient who is actively maniacal always loses flesh, often to a great extent. The nutrition, indeed, of the whole body suffers, as evidenced by harshness of skin, dryness of hair, and the like.

The foregoing symptoms may last a variable time—a few days, or weeks, or months—but sooner or later, if recovery is to take place, the restlessness gradually subsides, the loquacity ceases, and the patient instead of being lively and talkative becomes dull and taciturn. In some cases, indeed, the patient may pass almost directly into his normal sane condition, but it is more usual for a longer or shorter period of mental depression, or dulness to be passed through, before the mind is restored to its previous state.

Even, however, when recovery takes place convalescence is not always uninterrupted, but the process of amendment may be interfered with by a relapse, and this may occur on more than one occasion and yet the patient may ultimately be restored to vigour.

The above described symptoms in various degrees of combination form a picture of the ordinary forms of mania, as most usually presented to us. But individual cases vary considerably from this type, either in the direction of mildness or severity. The muscular over-activity may be so slight as merely to be evidenced by a little aimless restlessness, and fidgetiness, and incapacity to settle to anything, and the patient in ordinary conversation may appear rational and coherent. There is often also a semblance of wilfulness about a patient's acts and language, which conveys to the clinical observer the impression that he could control his vagaries if he liked. Or such a simple form of mania may declare itself by unusual liveliness, humour and gaiety, and a person may even present a certain mental brilliancy impossible to him at ordinary times.

There are yet other cases in which the morbid change is almost entirely on the moral side of the patient's nature, the intellectual being scarcely affected; as for example, when a man who has hitherto led a quiet, moral, sedate, business-like life, becomes restless, boastful, extravagant, inattentive to his affairs, and putting no check upon his appetites.

The proof that such cases belong to the class we are now considering, lies partly in the fact that all this is the expression of a *change in the character* coming on, it may be without obvious

cause, and partly by the observation that such a condition often occurs as a stage in a typical attack of mania, all these manifestations simply being precursors of an acute outbreak.

At the opposite end of the scale a class of very severe cases is met with which has been described as a special disease under the name **Acute Delirious Mania**. In this form the physical symptoms are so severe as to rank co-ordinately with the mental. The muscular restlessness and excitement is extreme, the patient pours forth a volume of incoherent talk, and his attention is so much in abeyance that he usually takes no notice of surrounding things and cannot be got to answer questions; he appears, in fact, to be almost unconscious of his environment.

There is combined with all this excitement much physical prostration. The temperature rises, often considerably; the pulse is small and rapid, the tongue gets dry and brown, and sordes forms on the teeth and lips. There is often great difficulty in administering food. Sleep is absent, or nearly so. The patient, in fact, often passes quickly into a typhoid condition, and death frequently ensues. These cases form one of the varieties of so-called "brain fever."

Pathology and Morbid Anatomy.—That the brain of a maniacal patient is in a hyperæmic condition is a legitimate conclusion from clinical facts, seeing that an excess of nervous action cannot go on, unless an excessive supply of nutrient material is furnished by the blood. And this conclusion is also borne out by the facts of morbid anatomy, for when death occurs in the acute forms of the affection, evidence of hyperæmia, both of the brain and its membranes, is constantly found.

On stripping the membranes the surface of the cortex is found to present a pink staining, which is either uniformly diffused or occurs in irregular patches. The cortex, too, on section exhibits congestion of its deeper layers—those adjoining the white matter. In some cases also the puncta cruenta of the white matter are numerous, and there are signs of excess of blood in the basal ganglia.

Microscopically, in addition to the evidences of vascular engorgement, there may be some swelling of the nerve cells of the cortex, but this is not constant, and the cells may appear quite healthy.

The excess of blood is, however, at least in the majority of cases, secondary,

being the result of an increased demand upon the part of the brain cells.

The question then arises, whence comes this increased demand? The view taken by the writer, is, that mania is an affection of the highest controlling plexuses of the brain, which results in the loss of the inhibitory action of these centres, in consequence of which the lower centres escape from their control, and acting over-vehemently and discordantly, attract to themselves an inordinate supply of blood.

On this view the maniacal manifestations are the result of over-activity of certain healthy portions of the brain, this over-activity being permitted by abeyance, or loss of function on the part of other portions. There would therefore be a negative and a positive condition in the brain of a maniacal patient—negative as regards the higher centres, positive as regards the lower. The primary affection would thus be located in the highest controlling and co-ordinating plexuses, and their tendency to implication is explained by the fact that they are the latest developed in the course of evolution, and are consequently the most unstable, and the most liable to give way.

Ætiology.—Mania may occur at all periods of life from youth to old age, but it is probably most common in young adult life.

The most powerful predisposing cause is undoubtedly hereditary taint, by virtue of which people come into the world with unstable brains, ready to fall into abnormal lines of action on meeting with adverse conditions in the environment.

The exciting causes are various, and are not peculiar to this special form of insanity. Anxieties and worries, domestic bereavements and mental shocks of all kinds, may precipitate an attack. Intemperance in drink is probably the most common exciting cause in men, and acts largely in women also. Injuries, especially cranial injuries, form a not infrequent cause, especially in the male sex. In women parturition and the puerperal state account for a large number of cases.

Terminations.—(1) *Recovery.*—This is the most frequent termination, the majority of cases recovering from a first attack. It is not however always complete, even when the patient is apparently well, a change of disposition being sometimes noted.

(2) *Death.*—This seldom occurs in the ordinary forms of the affection, but may

happen if the patient be old, or much debilitated at the outset, or the subject of organic visceral disease. It is, however, frequent in the acute delirious form.

(3) *Chronic Mania.*—This is a chronic form of the acute affection. The limit between the two is an arbitrary one, but if a case last more than a year it is usually included under this head. The noisy, dirty, destructive, patients who fill asylum wards are of this class. Chronic mania is, however, almost always associated with a certain amount of dementia.

(4) *Monomania.*—Not unfrequently after an attack of acute mania has subsided a delusional state is left—that is, the patient may appear rational on ordinary topics, and his memory may be good, but he nevertheless exhibits perverted judgment or actual delusion on one or many subjects.

(5) *Dementia.*—There are all degrees of this. An attack of mania may pass off and leave a person apparently well with the exception that the fine edge of his faculties is taken off, and he can no longer face the world as before. Or it may leave the mind a wreck, and the patient may henceforth live a vegetative existence, unconscious of his surroundings and entirely dependent upon the ministrations of others for his continued existence. And between these two extremes every variety is met with. The dementia which is consecutive to mania is as a rule more profound than that which is sequential to other forms of mental disease.

Prognosis.—This is good in proportion as the onset has been rapid and dependent upon a definite cause, and according as the patient is young and the reserve of nerve force good. It is unfavourable when the patient is old and debilitated, or when the disease assumes the acute delirious form. It is a good sign if in the acute forms the patient takes nourishment freely. Probably more than half the cases recover perfectly. The prognosis becomes bad if the disease lasts over a year.

Hereditary tendency is not unfavourable as regards recovery, but connotes a greater liability to the recurrence of the disease.

Treatment.—It might appear at first sight a simple matter to quiet the excitement of a maniacal patient by means of sedative drugs, and undoubtedly the most violent mania can thus be subdued for a time. But experience has not

endorsed the value of this treatment, for the effect of the drugs soon passes away, and continued persistence in their use appears to have a deteriorating effect on the nervous centres.

This statement is general and is not intended to imply that sedative drugs are never to be given in mania; the occasional use of them in selected cases may, indeed, be of benefit, but their routine use is certainly to be condemned.

Nor is it advisable to restrain the patient's disorderly actions by mechanical means, such measures having in most cases a decidedly injurious effect upon the brain.

The best measure to adopt in an ordinary case of acute mania is to get the patient out in the fresh air as much as possible and allow him to work off his excitement by muscular exercise. Walking a patient about all day long between two attendants in the open air will often prove the best possible hypnotic, and sleep obtained in this way is of much more value to the patient than that got by the administration of chloral or other sedative drugs.

But, if the temperature be much elevated and the patient too debilitated for outside muscular exercise, as when the disease approximates to the acute delirious form, he should be placed in a bed on the floor of a room which has been well covered with mattresses so that he may not injure himself. A padded room is preferable, though not always essential. In cases of this kind, much benefit is sometimes obtained from a prolonged warm bath with cold affusion to the head; this requires, however, to be used with caution. The wet pack has also its advocates, and may be tried in similar cases. It must be admitted, however, that these measures are often utterly futile.

The question of food administration is important. In the acute forms a patient will sometimes refuse food altogether, and, if so, there need be no hesitation in at once feeding him with the stomach-pump, as it is very important that abundance of nutriment should be introduced into the system or fatal collapse may ensue. Strong soups, beef essences and liquid custards may thus be given.

Stimulants are undoubtedly often useful, and should as a rule be given with food. Sometimes a glass of port or at night will act as a genuine hypnotic. A dry tongue is as a rule an indication for pushing the administration of food and stimulants, but, if the latter increase the

excitement, as they sometimes do, their use should be interdicted.

Cases of acute mania are with difficulty treated at home, and early removal to an asylum is as a rule called for. Even in the milder cases where the excitement is not great it is generally advisable to take the patient away from his home surroundings, the subjection to discipline and the moral control exercised in an asylum often acting as distinct aids to recovery.

JOSEPH WIGLESWORTH.

MARASMUS (Atrophy; Wasting), including **INFANT FEEDING.**—The term *marasmus* is usually reserved for the wasting of infants, though strictly it may be used for such a condition at any period of life.

As regards adults, such a degree of wasting as to merit special notice may be met with in organic disease of any of the viscera, in diabetes, and in the voluntary starvation of hypochondriasis, hysteria, or madness.

The late M. Parrot endeavoured to create out of *marasmus* a disease special to infants, which he named "*atlempsia*," but his views have not been generally accepted, and several different conditions are included under the term *marasmus*.

Congenital syphilis is usually associated with wasting, and organic disease of the lungs or other viscera may also lead to wasting. Catarrh of the stomach or intestines, apart from any dietetic error, may produce it, otherwise the cause must be sought in some defect in the feeding of the child, either as to the quantity or the quality of its nourishment. *Marasmus* is much more frequently encountered in those brought up by hand than in breast-fed infants.

The concomitants of wasting in young infants are constipation, with flatulence and griping pains, or sometimes diarrhoea and vomiting, the vomited matters consisting mainly of curdled milk. When these conditions or any of them are present, it is clear that the feeding is at fault; if the child is being suckled by its mother it is more than probable that it is put to the breast too often, as this is the universal panacea for a crying babe; it is not good for an infant any more than for an adult to be fed too often or to take too much at a time.

The health of the mother must be inquired into, as this will have a most important influence over the quality of her milk, which, as is well known, may vary, not only at such times as the menstrual

periods, but may be affected by purely emotional disturbances. If the mother be in good health and the child is not put too frequently put to the breast, a chemical and microscopical examination of the milk should be made to see in what particular it departs from the normal. Where a wet nurse is employed, the infant may waste from the fact that the date of her lactation is in advance of that which is necessary for the child, since changes in the character of the milk take place during the whole period of lactation.

In children who are brought up with the bottle, the malnutrition is very frequently chiefly due to the kind of bottle used, a long india-rubber tube and a sour cork are not calculated to make the milk which passes through them agree with the infant, and they are conditions which largely prevail; even when the tube and cork have been successfully kept sweet, the child is often allowed to go on sucking at the tube after the bottle is empty, a procedure which must lead to indigestion. Not unfrequently all possible trouble has been taken with the milk that is placed in the bottle to make it agree with the child, but finding that the infant did not thrive, its diet has been supplemented by the addition of sop or boiled bread, and yet to the surprise of the mother the infant continues to waste even more than before. In such cases even a return to a most approved dietary or the procuring a wet nurse does not always suffice to avert a fatal result. It seems as if the child's digestive powers had been so completely and permanently deranged as to be beyond the reach of improvement.

In the majority of cases, however, the prognosis is good, no matter how late the patient comes under observation.

The order to wean an infant because it does not thrive is one that ought very rarely to be given, unless it be obvious that the mother's state of health renders it imperative. Careful treatment of the mother and attention to her diet will materially alter and improve the quality of her milk, whilst, if it seem too rich for the infant, weak barley-water may be given alternately with the breast, or a few teaspoonfuls immediately before being put to the breast. The subject of infant feeding is dealt with more fully in the following section.

JOHN ABERCROMBIE.

Infant Feeding.—The best food for babies is, of course, their mother's milk. The child should be put to the breast

three times in the first twenty-four hours, and afterwards every two hours for ten minutes at a time. During the first twenty-four hours the secretion of milk is scanty, but a healthy child does not suffer from this. The only proof that the mother's milk is healthy and sufficient for the child, is its well-being and steady increase in weight. If it be fretful and cease to gain weight, it is possibly because the mother's milk is poor in quality and insufficient in quantity, and in that case breast-milk must be supplemented or replaced by other food. The milk supply may be deficient from the first, so that the child has to be brought up entirely "by hand" as it is called. It is better, if possible, to secure a wet nurse, but this cannot always be done.

The most easily obtainable substitute for human milk is cow's milk. This differs from human milk chiefly in containing much more casein. The casein is coagulated by the gastric juice into lumps or curds much larger than those formed by the casein of human milk. These large lumps are digested slowly and with difficulty. Hence cow's milk must be diluted. In the first month one part of milk should be mixed with two of water and sweetened. Of this the child should have from 1 pint to 1½ pint in the twenty-four hours. As the child gets older the proportion of milk to water must be gradually increased, and the quantity taken also increased. Pure cow's milk should not be given till the child is at least six months old. The best milk is that which is last expressed from the teat, and known by dairymen as "strippings" or "afterings;" it contains more cream than the rest of the milk.

This is the simplest diet on which to bring up a child that cannot be suckled. But there are many children who cannot digest this; they vomit, pass undigested curds in the fæces, and do not thrive. In such a case the diet must be altered so as to increase the digestibility and the nutritive value of the food.

To prevent the coagulation of the casein into large masses, the milk may be boiled (a measure which has the further advantage of preventing it from carrying infection), or it may be diluted with barley water or with lime water, or it may be peptonized by means of Fairchild's or Benger's peptonizing powders.

To increase its nutritive value, it may be diluted with whey (milk from which the casein has been separated) as in the

so-called "artificial human milk;" and cream and raw meat juice may be added. If milk continue to disagree, however administered, the child may for a day or two be fed upon cream, diluted and sweetened, and raw meat juice.

The latter is made by finely mincing fresh rumpsteak, and stirring it up with water, one part of water to four of meat. It should soak for half an hour. Then the meat is put between folds of muslin, and the juice expressed by twisting.

Condensed milk is often used, and has the advantages that it keeps perfectly, and that its casein coagulates in smaller masses. The objection to most forms is that to preserve the milk much sugar is added, which is apt to undergo acid fermentation after being taken. Therefore *unsweetened condensed milk* is the best kind. It must be remembered that for young infants condensed milk must be diluted much more than the instructions given with the package direct.

Milk may be given with the addition of farinaceous foods. It is common for ill-informed mothers to thicken the milk with corn-flour, bread, arrowroot, or biscuits. Such food disagrees with young infants, because they cannot digest starch. Farinaceous foods are made in which the starch is more or less perfectly converted into sugar. These may be divided into three chief classes.

(1) *Malted Foods*.—In these malt is mixed with wheat meal, and by the action of the diastase in the malt upon the starch in the meal, the starch is changed, first into dextrine, then into maltose, then into grape sugar. In some this process is only commenced, and is set going again when the food is mixed with water, being then completed in 10 or 15 minutes, and in some the process is complete. Among the malted foods may be mentioned Mellin's, Allen and Hanbury's, Savory and Moore's.

(2) *Baked Flour*.—In these preparations the starch is by heat partly converted into sugar. This is excellent for older children, but not good for very young ones. Of this kind are Ridge's and Neave's foods.

(3) *Pancreatized Foods*.—These are made of wheat meal with pancreatic ferment. This ferment converts starch into dextrine and grape-sugar, and proteids into peptones, and emulsifies fat. This is the most easily digested food of any, but some think that it relieves the stomach from too much of its work, and thus may retard the development of

digestive power. Benger's is a food of this kind.

Meat juices, meat essences, jellics, &c., are often recommended, and are useful, but none of them so good as the raw meat juice described above.

G. E. HERMAN.

MASSAGE (including the **Weir Mitchell Treatment**).—It is not easy to give in a very few words a clear and comprehensive definition of massage, but it may be said that massage, properly so called, is more than mere rubbing or shampooing. It includes systematic, skilled manipulation and scientific rubbing.

To properly carry out this mode of treatment, the operator (*masseur* or *masseuse*, as the case may be) must have had a thorough training under one skilled in the different methods, and should have at least a good general notion of the surface anatomy of the body, and the position of the chief organs.

Massage has been at different times brought into discredit by patients being allowed to fall into the hands of ignorant persons, calling themselves medical rubbers, who are possessed by the one idea, that rubbing will cure everything. Serious harm has in this way often resulted, and it need hardly be insisted upon here that massage should be carried out only under the direction of a medical man, who has taken the trouble to make himself practically acquainted with its processes and methods.

Several different forms of manipulation are included under the general term massage. One form consists of a kneading and pressing or squeezing of the muscles, with a certain amount of rotatory movement. If, for example, it is wished to act upon the muscles of a limb the operator begins at the lower part and works steadily and uniformly towards the trunk, taking up one muscle or group of muscles at a time, firmly grasping and rolling them. In dealing with the smaller muscles one hand will suffice, but in the case of the limbs both hands are used, and they should follow each other with such regularity that no part is missed.

In another form, the palm of the hand is made to pass over the part that is being operated upon, in a direction towards the body. It may consist of a mere gentle stroking of the surface, or pressure intended to affect the deeper structures, may be employed. One hand

follows the other in a regular rhythmic manner, so that when the stroke of one is finished the other is in position ready to commence.

A third method, known as *friction*, consists in stroking or sliding one hand over the muscles, combined with pressure of the tips of the fingers of the other hand in a somewhat rotatory manner. This is frequently of use in dealing with affections of the tissues in the neighbourhood of joints. In another form different kinds of percussion are made by means of the finger tips, or by the palm of the hand, or by its edges.

The foregoing is a mere outline of the different processes, but the art of massage cannot be learned from any description. The different procedures may be employed in some instances singly, or two or more may be suitable in combination, according to the circumstances of the particular case.

General massage, that is, when the manipulations are applied to the whole body, is useful when it is desired to stimulate the nutritive functions generally, to promote tissue change in the different organs, and to increase the excretion of waste products. Hence, when for any reason the patients cannot take sufficient exercise, general massage is an excellent substitute, for under its use, not only are the muscles passively exercised, but the internal organs also are stimulated and rendered functionally more active. Improved appetite, better assimilation and increased weight are the results.

By local massage the circulation in the blood-vessels and lymphatics is accelerated, probably both on account of the increased contractions of the muscles, and by the effects of direct pressure. The nutrition of the part acted upon is greatly increased, waste and effete matters are more speedily and effectually removed, the muscles become firmer, and there is a marked increase of muscular power.

Of the local uses of massage, a few examples only need be given.

Marked benefit is obtained in many cases of infantile paralysis, from a well-regulated course of massage, commenced gradually and carried out systematically. Again, in cases where splints or supports have been in use for a long time, the resulting attenuation and weakening of the muscles, rapidly disappear under its use. In hysterical affections of joints and limbs, massage has been found of the greatest value, and it is often helpful

in cases of long-standing paralysis, even when due to some organic lesion.

Massage applied to the abdomen, in patients suffering from atonic dyspepsia with flatulent distension, and from constipation, is often attended with good results. In constipation, a course of systematic kneading and rubbing over the colon, commencing at the cæcum, and carried along its course to the left iliac region, is followed by gradual relief of the symptoms and usually leads to the establishment of regularity in action, although the time taken to accomplish this desirable end varies considerably. In some cases the bowels begin to act regularly at the end of the first week, but in others not until several weeks have elapsed. The result is to be attributed mainly to the stimulating effect of massage upon the intestine, by which peristaltic action is increased, and not to any mechanical effect. In the case of faecal accumulations, however, which can be felt and which yield to pressure by the fingers, probably also undergoing modification in shape by that means, the mechanical agency is not without its effect.

Weir Mitchell Treatment.—In this form of treatment general massage plays an important part. The success, however, that attends this method, especially in cases of hysteria and of nerve prostration, is attributable to the combination of the several factors that constitute it—namely, (1) rest, (2) isolation, (3) systematic feeding, (4) massage, and (5) electricity.

Each of these is important, and it is to Dr. Weir Mitchell that we are indebted for recognizing the value of the combination. In his excellent little work entitled "*Fat and Blood*," Dr. Mitchell points out that these several means are all employed by physicians, but as a rule, only one or two of them at a time, and not all of them in combination.

The combined elements of the treatment must not be forgotten, isolation with rest, massage, with or without electricity, and excessive feeding. Dr. Weir Mitchell lays least stress upon electricity, observing that, if he had to omit one part, he would have no hesitation in leaving out the electrical treatment.

Although the patients who derive most benefit from such a course of treatment are those of the neurotic type, often more or less markedly hysterical, still the method is not restricted to the hysterical class alone.

Isolation takes them away from and out of their old and often too sympathetic surroundings, thus giving the nervous system a fair chance of recovering its tone and stability. Under the influence of properly regulated massage, their nutritive functions receive a notable stimulus. Massage more than supplies the place of exercise, tissue metamorphosis becomes rapid, and waste products are more effectually eliminated. A steady increase in flesh and colour, along with improved muscular and nerve power, is the result.

The duration of the treatment will vary in different cases, but six weeks may be said to be the shortest time that should be allowed for such a course, and ten or twelve weeks are required in most cases.

During the first part of the time—four to six or eight weeks in extreme cases—the patient should be kept altogether in bed, being lifted on to a couch only for, perhaps, an hour in the morning and evening. The room should be airy, with, if possible, a sunny aspect, but in cases of extreme sensitiveness to light and noise, the quietest room available may have to be selected, for the commencement of the treatment, and the change made as the case progresses.

Much depends upon the choice of the nurse; she must not only be a perfectly trustworthy woman, but she should also combine brightness and cheerfulness, with tact and firmness. It rarely happens that one person can be both nurse and masseuse, but in some instances this can be managed, or the nurse can do part of the massage.

With regard to the diet, milk not too rich, and slightly warmed, should, during the first few days at least of the treatment, constitute the entire diet. It should be given in small quantities of three or four ounces at first, every two hours, and should be sipped very slowly. The quantity taken at a time may be gradually increased, and the interval between the supplies correspondingly lengthened.

Constipation is a usual result of this diet, and may often be obviated by giving a small cup of black coffee early in the morning. If that does not suffice some slight aperient will be required.

In five or six days, a small breakfast, consisting of a cup of cocoa and a slice of bread and butter, may be added to the dietary. A few days later, a mid-day dinner of fish or mutton chop, with a little milk pudding may be also taken,

still keeping up the same quantity of milk as before.

At the end of a fortnight from the commencement of treatment, a light evening meal, like breakfast, or of strong soup with bread, will complete the dietary. Extract of malt and some preparation of iron are useful adjuncts to the treatment.

This large amount of food with vigorous massage is kept up for three or four weeks. At the end of that time, the quantity of food is gradually lessened, and the massage and electricity applied at longer intervals.

Passive movements of the limbs are then begun gradually; the patient is allowed to sit up in bed for a short time, and soon to sit up in a chair for a few minutes daily. This is increased by degrees along with exercise, until, at the end of the treatment, the patient is only required to rest for three or four hours daily.

The return to the ordinary ways of life must be gradual. In many cases, a sea voyage, or a prolonged tour, where this is possible, does much to confirm the cure. Unfortunately, relapses occasionally recur in patients who have been treated by this method, but as at present, equally successful results are not obtained by any other means, this fact does not tell against its adoption in suitable cases.

R. W. BURNET.

MEASLES (Morbilli; Rubeola).—

A highly infectious, acute disorder, characterized by an eruption which spreads over the whole body in the course of thirty-six hours, and is preceded and accompanied by marked fever and catarrh of the eyes, nose and respiratory passages.

Symptoms.—As a rule, the health is undisturbed during the period of incubation. The stage of invasion is ushered in by the usual symptoms that accompany a febrile attack—viz., malaise, headache, anorexia, nausea, drowsiness and fever, the temperature reaching perhaps 103° F., or even higher, but it is not uncommon for it to fall to normal the next day, causing the erroneous belief that the illness is at an end. Catarrh of the eyes, nose and air-passages soon appears, and the suffused look about the eyes, the frequent sneezing and the hard cough put the experienced observer on his guard. Epistaxis is not uncommon at this stage. The soft palate will be found to present a well-defined blush with numerous small red spots on it, and

these spots may also be seen spreading on to the cheeks; the tongue is coated. In children predisposed to them convulsions often occur at this period.

The stage of invasion usually lasts till the fourth day, when there is an increase of the general symptoms and the eruption makes its appearance. This is first seen, as a rule, either on the cheeks, or temples or in the neck, just behind the jaw, and consists of small, dark red maculopapules, the colour being darkest in the centre. These increase in size and become slightly elevated, they have a velvety feel, and are roundish or crescentic in outline, their margins being sharply defined. The intervening skin is pale or injected, and the patches tend to coalesce, forming larger blotches or a diffuse redness, which disappears on pressure.

The eruption comes out very rapidly, the face being covered in a few hours and the rash spreading on to the trunk and finally to the limbs; it is generally complete in twenty-four hours. Whilst it is coming out a peculiar odour is sometimes noticeable. When the eruption is at its height there is a certain amount of subcutaneous infiltration, the face appears swollen, and the hands and feet feel tight and uncomfortable. The fever continues to rise after the eruption has appeared, and its greatest height corresponds to the greatest intensity of the rash. The pulse is generally proportionate in frequency to the degree of fever.

The general symptoms are aggravated whilst the rash is coming out, there is marked photophobia and lachrymation, profuse secretion from the nostrils, and a troublesome, hard, hoarse cough. In rickety children the cough and breathing are often croupy in character. The tonsils are sometimes swollen and there may be deafness from extension of the catarrh along the Eustachian tubes; the glands behind the jaw and in the groin are occasionally enlarged. The urine is scanty and high coloured, but rarely contains albumen. Not infrequently profuse diarrhoea is among the early symptoms, if so it usually subsides spontaneously.

The rash fades in the order of its appearance, clearing off the face first; its total duration is usually four days; it leaves reddish-brown stains, which may persist for two or three weeks, and a slight branny desquamation, only perceived, however, on the parts which are uncovered—*e.g.*, the face and hands. With the disappearance of the rash the

temperature rapidly falls to normal, and the other symptoms gradually subside.

The above constitutes what may be considered the normal type and course of measles; many departures from this are met with. Sometimes no prodromal fever is observed, the malady appearing to commence suddenly with the rash; in some there is no catarrh, or the rash is absent. Such cases could only be recognized during an epidemic of the disease. All degrees of severity may be met with, from the mildest to the most malignant form in which the eruption is hæmorrhagic (black measles). In the severer forms great prostration is at once the most marked and important feature, the pulse is very frequent, small and feeble, the respirations hurried, and although the temperature is very high, the extremities are cold. The rash in such cases is imperfectly developed or of a livid tint, there is delirium or subsultus tendinum, and convulsions or coma may precede death.

Variations in the character and site of the first appearance of the rash may be met with. For instance, it may begin on the buttocks, and at first the eruption may be quite papular but it is never vesicular. In a few cases a relapse of the eruption has been observed.

Diagnosis.—The catarrhal symptoms are of the greatest importance; they are not met with in any of the other acute infectious disorders. Another diagnostic point is that the fever does not subside on the appearance of the rash, but goes on increasing. In *rötheln* the eruption is very similar but the spots are paler and less crescentic, and there is no catarrh and often there are no prodromata. The enlargement of the lymphatic glands in the latter disease is another important diagnostic feature. In scarlet fever the period of incubation is much shorter, the temperature is higher, the pulse more frequent, vomiting is often present, there is no catarrh, but the throat is sore and the tonsils very red. The eruption consists of minute bright red spots followed by flaky desquamation.

In variola there is lumbar and sacral pain and vomiting, but no catarrh; the fever subsides when the rash appears; the papules are very shotty and speedily become vesicular; vesicles may be found in the mouth. In syphilitic eruptions there will be other evidence of syphilis. catarrh is absent and the face is often unaffected.

Complications and Sequelæ.—These are more numerous and of greater gravity

in relation to the original disease than in any of the other infectious disorders.

Capillary bronchitis and catarrhal pneumonia are the most common and the most dangerous; some catarrh of the air passages is always present, and in young children, especially the rickety, this is very likely to spread to the smaller tubes, the condition being then very serious. Under these circumstances the lividity of the lips and the amount of recession of the chest will form the best guides both in prognosis and treatment. Enteritis, colitis, laryngitis and epistaxis may also occur at this stage. At a later period otitis, with perforation of the tympanum, is very common. Ulceration of the gums, chronic laryngitis and chronic broncho-pneumonia are apt to follow. Caseation of the bronchial glands, with subsequent general tuberculosis, is by no means uncommon, whilst empyema is also frequently seen: gangrene and noma of the face or vulva are rare complications of measles. Membranous pharyngitis and laryngitis may occur together or separately, the condition then for all practical purposes being diphtheria. Whooping cough is so often met with as a sequela of measles as to suggest that there must be something more than an accidental connection between the two disorders. Scrofulous children are especially liable to have some sequela left by measles; it may be chronic ophthalmia or otorrhœa, enlarged glands in the neck, or some lung mischief.

Prognosis.—This is generally favourable, but much will depend upon the state of health of the patient; a very guarded opinion should be given in the case of rickety children. The probability of some sequela resulting in the case of scrofulous children should also be borne in mind. The character of the epidemic must also be considered, as they vary much in degree of severity. Usually high fever during the stage of invasion is of bad omen, also the persistence of the fever after the rash has faded, as this is an indication of the presence of some complication. Great prostration is a very unfavourable sign, and "black measles" is almost invariably fatal. The presence of any complication naturally increases the danger.

Pathology.—The eruption is due to hyperæmia around the orifice of a sebaceous follicle; this is followed by congestion and the exudation of a certain amount of plasma, which is the cause of the swelling. The rash disappears after

death and there are no characteristic post-mortem appearances, though inasmuch as the lung complications are usually the cause of death, some evidence of this and some enlargement of the bronchial glands will generally be present.

Ætiology.—On this subject very little is known, no specific contagium having as yet been discovered. There is the best evidence that the disease may be communicated by the breath or by the nasal mucus, and it is also certain that it may be carried by fomites in the clothes of a third person. The risk of infection is very great during the period of invasion and whilst the rash is coming out, and it continues for two or three weeks after this, but there is no reason to believe that it can be communicated during the period of incubation, the duration of which is about ten days. All ages are susceptible to the disease, and as most people have it in childhood it follows that it is most common amongst children. As an epidemic disease it is less common in the summer months, but in populous cities it is practically endemic. The recent epidemic in the Fiji Isles shows that when it attacks a people who have no protection, hereditary or otherwise, it is a serious malady. Some persons are so susceptible that they have a second, third, and even sometimes a fourth attack; in such cases each attack is often very severe.

Treatment.—In a mild case it will be sufficient to keep the patient in bed for a week and in the room or house for two or three weeks more. Whilst the fever lasts he should only be allowed liquid diet. Diaphoretics may be useful. The diarrhœa need not be checked unless it be very severe and persistent, and in that case cold compresses should be applied to the abdomen, and astringents and bismuth given internally. The inunction of lard or vaseline with a little carbolic acid is often useful. If the temperature be very high, quinine or some other antipyretic drug should be given, and the patient packed or treated with cold baths. It is a mistake to attempt to bring the rash out again if it disappear early, as such cases are often of an asthenic type and require a stimulating treatment. The cough and hoarseness will often be relieved by wet compresses to the front of the throat, and by painting the fauces with glycerin or glycerin and borax.

The various complications must be treated as they arise. As regards the general management of the sick-room

and the means for preventing the spread of the complaint, reference may be made to the article on DISINFECTION.

JOHN ABERCROMBIE.

MEDIASTINUM, ANATOMY OF.—The mediastinum is the space in the thorax between the two pleural sacs. This interval is, for the sake of convenience, divided into two parts, according as they are situated before or behind the heart, and the term anterior or posterior mediastinum is applied to these parts. In the upper part of the anterior mediastinum are contained the remains of the thymus gland, and the origin of some of the hyoid and laryngeal muscles. It is narrowed at the centre, and in the lower part there is some areolar tissue, together with the left triangularis sterni.

The posterior mediastinum, or the part behind the heart, is larger than the anterior. In the posterior mediastinum are contained the aorta, the vena azygos and the thoracic duct, the œsophagus with its nerves, the trachea, the splanchnic nerves at the lower part and some lymphatic glands. Some authors describe a middle mediastinum, and give as its contents the heart and the great vessels connected with it, and the bifurcation of the trachea.

F. DE HAVILLAND HALL.

MEDIASTINUM, EMPHYSEMA OF.—The presence of air in the cellular tissue of the mediastinum.

Dr. Champneys has directed attention to the frequent occurrence of mediastinal emphysema in fatal cases of tracheotomy; thus in twenty-eight cases of tracheotomy Angel Money found it present sixteen times, and in two of these cases it was associated with pneumothorax; sometimes it exists apart from emphysema of the neck. It has also been found in fatal cases of diphtheria in which tracheotomy had not been performed. The route taken by the air has been proved, by experiment, to be behind the deep cervical fascia. The existence of mediastinal emphysema, especially when combined with pneumothorax, may account for some of the deaths occurring after tracheotomy. "The conditions favouring the production of mediastinal emphysema are division of the deep cervical fascia, obstruction to the air passages, and inspiratory efforts. The dangerous period during tracheotomy is the interval between the division of the deep cervical fascia and the efficient introduction of the

tube. The incision in the deep cervical fascia should not be longer than necessary in the direction of the sternum. It should on no account be raised from the trachea, and this should be particularly remembered during inspiratory efforts" (Champneys, *Med.-Chir. Trans.*, vol. lxx. p. 85). F. DE HAVILLAND HALL.

MEDIASTINUM, INFLAMMATION OF (Mediastinitis).—Inflammation of the cellular tissue found in the mediastinum.

Symptoms.—The two prominent symptoms of inflammation of the anterior mediastinum, when the condition has gone on to suppuration, are dyspnoea and constant, severe pain referred to the post-sternal region. The usual constitutional symptoms attendant upon the formation of pus are, of course, present. On physical examination nothing may be detected, but if a large formation of matter occur, a fluctuating tumour may be felt above the episternal notch, or in one of the upper intercostal spaces, usually on the left side, and this bulging may have an impulse on coughing, or an apparently expansile pulsation may be communicated to it from the heart.

The symptoms of posterior mediastinitis are still more vague; there may be local pain and tenderness, and possibly dysphagia from pressure on the œsophagus. Physical examination does not render much assistance in the diagnosis.

Diagnosis.—In most of the cases of abscess of the anterior mediastinum some history of the cause is obtainable, in its absence it may be very difficult to distinguish a pulsating swelling due to suppuration from an aneurysm.

Prognosis.—This must be guarded, in view of the possibility of pus making its way downwards and bursting into the lung or pleural cavity.

Pathology.—Suppurative mediastinitis may be set up by the extension of inflammation from the neck, as after tracheotomy or when, in treating bronchocele by injection the fluid has passed into the connective tissue of the thyroid gland instead of into its substance. Tubercular disease of the lymphatic glands is another cause. Many cases own a traumatic origin, resulting either from blows on the sternum, or from the impaction of foreign bodies.

Treatment.—Surgical treatment is imperative as those cases of mediastinal abscess which have been operated on and freely drained have recovered, whereas if the pus remain pent up, a fatal termi-

nation of the case is almost certain. In a case reported by Ballance (*Proc. Med. Soc.*, vol. xii. p. 13) trephining the gladiolus was followed by recovery.

F. DE HAVILLAND HALL.

MEDIASTINUM, TUMOUR OF.

—A new growth, taking its origin from the anterior or posterior mediastinum.

Symptoms.—These are at times very obscure, a frequent pulse and increased rapidity of respiration, with vague pains through the chest, perhaps attributed to rheumatism, may be all that exist to awaken suspicion. In fact, until the tumour begins to attain the bulk sufficient to cause symptoms due to pressure on neighbouring parts, it may be impossible to speak with any degree of certainty as to the nature of the case. The symptoms of mediastinal tumour are almost entirely due to direct or indirect pressure. The one which, as a rule, first attracts the patient's attention, is *pain*. This may be so slight as to be hardly noticed, or it may be extremely severe. It may be limited to the affected side and fixed to one spot, or it may radiate over the chest and arm; the pain may be either dull or lacerating in character. In some cases the attacks of pain resemble angina pectoris.

Dyspnœa is a very constant symptom in cases of mediastinal tumour, and, as a rule, it comes on early and is progressive; it may, however, be paroxysmal, and bouts of distressing orthopnœa may occur. The dyspnœa is due to a variety of causes; for instance, the trachea may be compressed by the tumour, though tracheal stenosis is an infrequent sequence in mediastinal tumours, more frequently there is compression of one or other primitive bronchus. Besides being due to direct pressure on the air passages, the dyspnœa may be of laryngeal origin due to paralysis of the crico-arytenoidei postici from pressure on one or both pneumogastric nerves or on both recurrent laryngeal nerves. Dyspnœa may also be due to the changes brought about in the lungs as the two-fold result of the pressure and irritation of the new growth, *i.e.*, pleurisy, bronchitis, and œdema or gangrene of lungs. Obstruction to the vascular system by pressure on the blood-vessels may also cause dyspnœa.

Cough generally demands attention in connection with dyspnœa. In some cases it is of a particularly harsh, reverberating character, causing the patient much distress; in others it

comes on in paroxysms like whooping-cough.

Expectoration varies much both in character and amount in individual cases. In some patients the cough may be quite dry, in others one of the most troublesome symptoms may be a copious watery or muco-purulent expectoration. In cases where erosion of blood-vessels has occurred or a vascular growth has given way, the sputa may be blood-stained or the hæmorrhage may be so profuse as to cause death from suffocation or from mere loss of blood. A gangrenous condition of the lung will be commonly revealed by the fœtor of the breath and expectoration.

The *voice*, as in cases of aneurysm, may be affected by pressure on the recurrent laryngeal nerve causing the corresponding cord to assume the cadaveric position, or the hoarseness may be due to the chronic laryngitis resulting from extension upwards of inflammatory changes in the lungs or trachea.

In addition to the anginal symptoms already referred to, the patient may complain of *palpitation* and discomfort in the cardiac region. In a few cases the only symptom of which the patients have complained has been *dysphagia*; this is particularly apt to occur when the malignant growth starts in the posterior mediastinum.

Emaciation is the rule in mediastinal growths, and is, of course, especially marked when there is any obstruction to the lumen of the œsophagus.

Temperature.—Fever is a symptom which cannot be associated with pressure. In some cases a regular daily rise and fall of temperature has been recorded, and it has been suggested that the rise of temperature is more characteristic in cases of lymphadenoma than in cancerous disease. In many cases, however, a very probable explanation of the rise of temperature is to be found in the presence of an intercurrent pleurisy.

In making a physical examination of the patient it is most important to pay attention to the combination and succession of the physical signs.

On *inspection*, the patient may be found pale or cyanosed, or possibly he may have the aspect of health. Distended veins, and œdema of the head, trunk or extremities, especially when confined to one side, are very important signs. In one case a lympho-sarcomatous mass extending along the heart had exerted so much pressure on the inferior vena cava

that œdema of the lower extremities, and enlargement of the superficial veins on the abdomen, were the most prominent symptoms. The fingers may be clubbed. On examining the chest, loss of movement, diminished or increased bulk of one side, obliteration or retraction of the intercostal spaces, and the presence of local bulgings may be noticed. Contraction of the affected side is met with, especially in cases of pressure on the main bronchus. The apex beat may be much displaced. The writer has put on record a case in which during life the impulse of the heart was felt in the right axillary line, and at the autopsy the apex was found in this position. The results obtained on *palpation* are variable; if there be a mass pressing upon and occluding one bronchus, there will be a great diminution, or even entire absence of any vocal fremitus: but in cases where there is a solid mass intervening between the chest wall and the bronchus, without compressing the latter, the vocal fremitus may be augmented. The *Cyrtometer* may be employed to show the changes in shape which the thorax has undergone. On *percussion*, a marked sense of tactile resistance is experienced if the growth extend to the surface; in some cases a characteristic amphoric note may be elicited if healthy lung be compressed by the tumour: in other cases the dullness may be due to collapse of the lung from pressure on the main bronchus, but in a case observed the writer, notwithstanding that the respiratory murmur was absent, the note on percussion was hardly to be distinguished from that on the sound side, though the post-mortem examination showed that the bronchus was occluded by the pressure of a cancerous mass. If there be great œdema of the chest walls it is frequently impossible to attain any correct results from percussion.

On *auscultation* the respiratory murmur is usually suppressed over the site of the tumour; at times, however, when the tumour exists as a solid mass intervening between chest wall and bronchus, without obliterating the latter, bronchial breathing may be heard over the dull area. Vocal resonance, like vocal fremitus, is usually absent. The heart-sounds may sometimes be so well conducted through a solid mass as to suggest a suspicion of aneurysm.

As regards the *pulse*, an inequality in the radial pulses, as is met with in aneurysm, is not of infrequent occurrence; it is generally brought about by

pressure of the tumour on the subclavian artery of the side corresponding to the weaker pulse. The *pupil* also exhibits changes similar to those seen in aneurysm, *i.e.*, at first the pupil may be dilated from irritation of the sympathetic, and later on complete paralysis of the sympathetic supply to the iris leads to uncontrolled action of the third nerve, and consequent contraction of the pupil.

Laryngoscopically, the changes met with in aneurysm may also be seen in mediastinal tumours, but perhaps not quite so commonly in the latter as in the former. At first the vocal cord may be seen in the position of phonation, this being due to the abductor filaments of the recurrent laryngeal nerve succumbing first to the pressure; after a time the adductor filaments are affected, and the cord falls into the cadaveric position, *i.e.*, the position midway between phonation and inspiration.

Diagnosis.—Aneurysm and pleural effusion are the two conditions from which a mediastinal tumour has most frequently to be diagnosed. The differential diagnosis of mediastinal tumour from *aneurysm* will be first considered. As regards symptoms there are none which are of any value in distinguishing between the two conditions, and this will be readily admitted when it is remembered that in both these diseases the cause of the symptoms is one and the same, *i.e.*, they are either directly or indirectly the result of pressure. It has been stated that in malignant tumour of the mediastinum the onward progress of the disease is much more sure and steady than in aneurysm, in which the patient is liable to alternations of improvement and retrogression, but the writer can recall at least one case which controverts this view—*viz.*, the case of a patient suffering from a malignant growth in the mediastinum (as was proved post-mortem), in whom the improvement, which ensued after the administration of iodide of potassium and the enforcement of rest, was so great as to strengthen the idea that an aneurysm was the real cause of the trouble. It therefore appears that one must rely almost entirely on physical signs for the diagnosis, though such conditions as the youth of the patient, the female sex, and a healthy state of the arteries, may assist in deciding adversely to an aneurysm.

In favour of a tumour would be the absence of the sounds of the heart, or of any impulse over the dull area, especially if this be large and the evidence of ex-

tension of the tumour in several directions at the same time. The existence of glandular swellings or lumps in the thoracic parietes also go to prove the presence of a tumour. For the diagnosis of an aneurysm the diastolic shock, particularly when combined with pulsation, is of the greatest value. Severe pain, especially pain felt posteriorly, is in favour of aneurysm.

The diagnosis of mediastinal tumour from *effusion into the pleural cavity* is sometimes even a more difficult matter than to distinguish it from aneurysm; the writer has recorded in the *Transactions* of the Clinical Society (vol. xiii.), a marked example of this difficulty. In the case in question the whole of the left pleural cavity was filled with a mass of round-celled sarcoma, not much more solid than thick pus; there was uniform dulness over the whole of the left chest, the dulness transgressing the median line, the heart was displaced, and there was an entire absence of respiratory murmur, vocal resonance and fremitus, in fact all the physical signs usually met with in pleural effusion were present. In favour of the diagnosis of a tumour as against effusion, is the limitation of dulness to the apical region and the comparative clearness at the base, the respiratory murmur being audible there, or irregularity in the dulness, resonant patches cropping out in the midst of the dull region, the presence of unilateral œdema, glandular swellings or tumours in the chest walls. The aspirator will often give valuable information, *i.e.*, a blood-stained fluid is in favour of pleurisy set up by a malignant growth.

Prognosis.—In the case of the malignant growths the tendency is slowly but surely towards a fatal issue, death usually occurring in from about three to six months after the commencement of symptoms of pressure, life being seldom preserved for over a year. Inasmuch as it is almost a matter of impossibility to diagnose the nature of the tumour, it is, therefore, advisable always to give a guarded prognosis, though if the symptoms be due to gumma they may clear up under the exhibition of full doses of iodide of potassium, and occasionally enlarged bronchial glands may subside if the patient be placed in favourable circumstances.

Pathology.—Though at one time almost all the tumours met with in the mediastinum were considered to be carcinomatous, and usually described as encephaloid cancer, primary carcinoma of the

mediastinum is rare, and the majority of the growths belong to the class of sarcoma or lymphoma, or partake of the structure of both, and are therefore termed lympho-sarcoma. Gummatous tumours have also been met with in this situation. The lymphomata occur as masses of enlarged glands in tuberculosis or in Hodgkin's disease.

It is usually difficult to decide as to the point of origin of mediastinal tumours; the lymphatic glands, the remains of the thymus gland, and the connective tissue itself are regarded as the points of departure.

Ætiology.—Nothing is at present known as to the causation of tumours of the mediastinum. All that can be said about them is that the sarcomata are more frequently met with in young people, and the carcinomata occur later in life. The majority of cases of mediastinal tumour have occurred under thirty. As regards sex mediastinal tumours are perhaps slightly more frequent among females, whereas aneurysm of the aorta is much more common in males.

Treatment.—This must be almost entirely of a palliative nature, except in those rare cases in which the tumour is of a gummatous nature, when iodide of potassium in full doses will generally have a striking effect. Even when there is no reason to suspect any syphilitic affection iodide of potassium often benefits the patient, and should therefore always be tried. Relief from pain must be sought for by the use of morphia, preferably hypodermically. Rubbing in the liniment of belladonna or the application of a belladonna plaster will sometimes alleviate the radiating pains over the chest. Where there is inability to take food from stenosis of the œsophagus, the patient must be fed per rectum, or gastrostomy may be undertaken. If dyspnoea be increased by effusion into the pleura, the patient may be relieved temporarily by paracentesis, but recurrence of the exudation is almost certain.

F. DE HAVILLAND HALL.

MEDICINAL RASHES.—An eruption on the skin is a not uncommon result of the internal administration of certain drugs. The occurrence may be due to the administration of the drug in excessive doses or for an undue length of time, but more generally depends upon an individual susceptibility of the subject.

Idiosyncrasy also modifies the nature of the eruption, the same drug giving rise to different forms of rash in different

persons. In individuals possessing a natural proclivity to diseases of the skin, drug eruptions may persist indefinitely, even after the complete elimination of the drug from the body. Minute doses of certain drugs (bromides, iodides) appear to be more apt to produce rashes than large ones.

Medicinal rashes may be conveniently divided into two groups:—

(1) Those which usually become pustular. *Bromine* and the *bromides* cause acneiform or furuncular pustules, in which, however, the sebaceous glands are not specially involved. The eruption occurs upon the face, back and chest, especially in persons with thick, oily skins. Macular discolorations, pale papules about the elbows and knees, *large, dusky, purple suppurating papilomatous-looking nodules*—often arising from scar-tissue—bullæ, rupioid lesions and conditions resembling erythema nodosum and urticaria, have been occasionally observed. Their appearance is often prevented by the simultaneous administration of arsenic.

Iodine and the *iodides* may cause erythema, sometimes papular, on the arms, face and neck, or a weeping and itchy eczematoid condition of the scalp, scrotum, chest, or limbs, but the commonest rash resulting from their use is pustular and acneiform, and has a similar appearance and distribution to that caused by the bromides. The bullous iodide rash is a rare but severe form which attacks chiefly the head and neck, hæmorrhage into the blebs occasionally occurring. Purpura from iodides generally occurs on the legs; it may simulate purpura hæmorrhagica and sometimes even proves fatal.

Renal disease and cardiac weakness strongly predispose to the occurrence of bromide and iodide rashes owing to the deficient elimination of the drugs in the presence of such conditions.

(2) Those which are erythematous in character.—These often cover extensive areas, develop suddenly, are sometimes preceded by a chill and accompanied by pyrexia and gastric disturbances. They disappear rapidly after discontinuance of the drug. *Belladonna* rash resembles scarlatina, and the throat is usually dry and red. *Chloral* rash is erythematous or urticarial; it itches, often involves the fingers and hands, and may terminate in hæmorrhage, ulceration and sloughing. The *copaiba* rash is a multiform erythema affecting by preference the hands, arms, feet, knees, and abdomen. *Mercurials*

occasionally cause an erysipelatoid condition, beginning on the face and spreading over the trunk. *Opium* and *morphia* cause itching, followed by a scarlatiniform rash on the trunk and inner and flexor sides of the limbs, followed by desquamation. *Quinine* may give rise to an erythematous or urticarial rash, accompanied by irritation of the conjunctivæ and fauces. *Salicylates* and *antipyrin* produce severe erythema with cedematous swelling, especially of the eyelids, and sometimes ecchymoses. *Arsenic* may cause an erythematous or urticarial rash, especially on the face and neck, more rarely a pustular eczema or purpura; herpes zoster develops with apparently undue frequency during its administration, and diffuse deep brown pigmentation often results from its free employment.

Erythematous rashes are said to occur occasionally from the use of cannabis indica, cubebs, digitalis, santolin, stramonium, quinine, strychnine and turpentine. Borax is supposed to cause a rash like psoriasis, and phosphoric acid to cause pemphigoid blebs.

Treatment consists in stopping the causative drug. The dose of bromide or iodide, if small, may be tentatively increased, and often with advantage.

J. J. PRINGLE.

MEDITERRANEAN FEVER is the most convenient term under which to describe a specific febrile disease observed at many points in the islands and littoral of the Mediterranean. It is characterized by long, irregular pyrexia, frequent relapses, rheumatic complications, constipation, and the absence of ulceration of Peyer's patches. It has been variously described under the names febris complicata, febris audoralis, gastro-bilious fever, fæco-malarial fever, Mediterranean gastric remittent fever, Malta fever, Italian fever, and Neapolitan fever.

The *symptoms* commence after an incubation period of six to nine days, and, as a rule, the onset is insidious. The earliest symptoms are loss of appetite, nausea, severe headache, pains in the limbs and general malaise. The tongue is large, indented by the teeth, and has a thin, yellowish fur; the pharynx is congested, the bowels as a rule are constipated, and the spleen and liver enlarged. There is slight cough, but no distinct bronchitis. Lumbar pain is frequently a troublesome symptom, and sciatica is not uncommon. Perspiration is profuse and may produce sudamina,

but no other eruption is present. The temperature curve is not constant; in severe cases it tends to be continuous, in mild intermittent, but the intermittent type may be observed to pass into the continuous, and *vice versa*.

The temperature is high, reaching 104°—106° F.; in fatal cases it may run up to 110°. After the symptoms described above have lasted ten days, the tongue cleans, appetite partially returns, delirium, if previously present, ceases, and the patient sleeps fairly well. But headache, the lumbar and sciatic pains, and the perspirations continue; anæmia increases and the temperature remains high. The pulse which at first was not much increased in frequency, now beats 110 to 120 in the minute, and palpitation is often complained of. In nearly half the cases one or more of the joints, sometimes several in succession, become red, swollen, and very tender. In this way the case drags on, often for many weeks. Ninety days is a common period to elapse before convalescence is established, and if relapses occur, as is frequently the case, the illness may be prolonged for nine months, a year, or even, it is said, two years.

The *diagnosis* requires to be made from enteric and from remittent fevers. From the former it may be distinguished by the irregular character of the pyrexia, the absence of diarrhoea, tympanites, and gurgling in the iliac fossa, the absence of rash, and the long duration of fever. From remittent fever the diagnosis is more difficult, and by many physicians this fever is classed with the remittent fevers. It is, however, unaffected by quinine, and the temperature curve does not, as a rule, present regular periodic remissions.

The rate of mortality is low, probably not exceeding 2 per cent. The most unfavourable elements in *prognosis* are, very high temperature and rapid pulse. In expressing an opinion the great liability to relapses must be remembered.

The *pathology* of the disease is obscure. It appears to originate in association with imperfect disposal of excremental matters during the warm season. A micrococcus has been found (Bruce) in the tissue of fatal cases, and a cultivation of this organism inoculated into a monkey has caused death in twenty-one days, the micrococcus being recovered from the spleen and liver. *Post-mortem* there is no swelling nor ulceration of Peyer's patches; the mesenteric glands are slightly enlarged, the spleen is large,

soft, diffluent, and intensely congested; the liver is congested and there is glomerular nephritis; micrococci are seen in enormous numbers in the spleen, and also in the liver and kidneys.

The *treatment* is unsatisfactory. The patient should, as soon as possible, be removed from the locality in which the disease was contracted, although the course of the fever is not thus cut short.

Quinine does not exert any directly curative action, and seldom has any beneficial influence. Antipyrin, given to the amount of 60 or 90 grains, reduces the temperature, relieves headache, and favours sleep. A short course of aconite has been recommended at the commencement of the disease. Advantage is derived from the occasional exhibition of calomel in combination with ipecacuanha and rhubarb, or colocynth. Italian writers have recommended the systematic administration of calomel. Salicylic acid and its salts appear to be injurious, depressing the heart and increasing the anæmia. The joint affections and the lumbar and sciatic pains may be treated by the liniments of aconite, opium, or belladonna; blisters are useless. The most important part of treatment is attention to ordinary hygiene and the systematic administration of liquid, easily digested food. DAWSON WILLIAMS.

MELÆNA signifies the presence of altered blood in the motions, the blood being more or less black in colour, and of tarry consistence. Properly speaking, the term should not be used when the motions are found to contain bright blood. It is a condition met with in several diseases. The blood need not have come from the intestines, or the portal system, or even from the stomach or œsophagus, as it may have been taken into the stomach from the mouth, having perhaps originally come from some vessel within the lungs. The presence of blood in the motions is by no means uncommon after a profuse attack of hæmoptysis.

MELANCHOLIA.—When the normal sense of well-being is absent, when the tension of nerve-force has fallen below a certain standard, an individual is said to be depressed. Not every one, however, who is afflicted with lowness of spirits is suffering from melancholia. This affection begins when gloom and despondency prevail for which no cause, or no adequate cause, exists in the environment.

Depressed feeling then is the cardinal

and salient feature of the affection under consideration, and this may exist without any intellectual aberration, or with so slight a degree of it that it may easily be overlooked. The individual becomes dull and moody, listless, incapable of mental or physical exertion. He takes no interest in his surroundings, but is dejected, sad, and weary of existence. At times, however, he may be able to rouse himself, and for a short time may appear to be himself again.

A stage more advanced may be reached without the intellectual faculties being notably impaired. The patient may now sit all day with his hands before him, gloomy and taciturn, taking but little notice of his surroundings, and unable to occupy himself in any way, but yet, if questioned, his answers may be rational, his memory good, and he may even assign plausible reasons for the change in his disposition. No distinct delusions being present, the person may appear to be sane, but the prevailing sense of misery casts its shadow over everything and, tinged with gloom all the patient's relations with the world, causes a false estimate to be made of things in general.

The more purely organic functions share in the general languor. The circulation is feeble, and the respiratory rhythm slow. The appetite is usually poor, the digestion disordered, and the bowels constipated.

On the physical side there is widespread nervous depression, on the mental side, pain; and these two characteristics sum up the cardinal features of a case of *Simple Melancholia*, which is the mildest form of the disease.

The case may progress no further, recovery taking place; but more often delusions are developed, and with them hallucinations and illusions are often associated. The most common hallucinations in melancholia are those of hearing "voices," ordering, accusing or reproaching. Hallucinations of sight present themselves in the form of "visions" of various kinds. Perversions of common sensibility may give rise to ideas of electricity being at work. A disordered stomach may lead a person to think that he is poisoned.

It is most important to recognize that in melancholia the derangement of feeling is primary, and the derangement of intellect secondary; that the association of the two is not a mere accident, but that the latter is distinctly developed out of the former. This may at least be safely affirmed of the great majority of

cases. It is exceedingly common for the delusions of melancholiacs to take the form of self-accusation of imaginary crimes, or the patients may live under perpetual dread of impending imprisonment or death. Their countenances express the terror which lies upon them, nor does the daily experience of non-fulfilment of their fears abate in any way the tenacity of their beliefs. Some patients, again, are extremely suspicious, and believe themselves the object of conspiracies or persecutions.

When the disease has attained this well-marked development, and when delusions constitute a prominent feature of the disease, it is often specially designated *Delusional Melancholia*.

Another type of the disease, in which the delusions have reference mainly to the state of the patient's viscera, has been described under a special name as *Hypochondriacal Melancholia*.

This form bears much the same relation to hypochondriasis that delusional melancholia does to the simple form of the affection. In it the morbid ideas are concentrated upon the more purely organic functions. A patient will assert that he has no heart, or liver or stomach; he will declare that his bowels are sealed up and never act, nor will the demonstration of a copious evacuation in any way alter the idea that has taken possession of him. Delusions with reference to the sexual organs are also very common.

To obtain, then, a picture of the developed form of the disease we have to add to the physical depression and the mental pain the presence of different forms of sense perversion, and of various kinds of delusions. The delusions may lie on the surface, or have to be sought for; they may be frequently and urgently expressed, or hidden in the depths of morbid feeling. But *passivity* may be said to be a feature of all cases alike. Such cases constitute well-marked clinical pictures, which may progress no further, and from which complete recovery may take place.

But there are other types of the disease, which may either develop out of what has been described above or present their own peculiar characters from the first. The passivity may be so strongly pronounced that the patient is plunged into absolute mental stupor. In a well-marked case of this kind external stimuli produce no effect on the patient, who appears to be perfectly insensible to surrounding things. He will stand like a

statue, or sit in a bowed attitude with his head bent forward on his chest, his eyes closed, his hands hanging helplessly by his side. The limbs may be flexible, and sometimes resemble those of a cataleptic patient in remaining for a time in any position in which they are placed. The saliva frequently dribbles from the mouth and saturates the patient's clothes. The urine and feces are usually passed in the position in which the patient stands or sits without his appearing to be aware of it. He has to be washed, dressed, and fed, and in fact treated in all respects like an infant.

Such cases have received the designation *Melancholia with Stupor*, *Stuporous Melancholia*, or *Melancholia Attonita*. They closely approximate to another form of mental disease, which has been described as *acute dementia*.

In the true melancholia with stupor, however, the face is expressive, not so much of fatuity, as of self-absorption or terror. The mind of the patient is considered to be so absorbed with the contemplation of some horrifying delusion as to be quite insensible to the environment. That this is so in certain cases is probable, both from the expression of countenance and the statements made by some patients after recovery, but it cannot be safely affirmed of all cases.

Allied to stuporous melancholia is a form which has been described as a special type under the name of *Resistive Melancholia*. This is best looked upon as a variety of the stuporous form, although some cases present much resistance and little stupor, and others much stupor and little resistance.

In this form the limbs, instead of being flexible, are rigid, and become more so when attempts are made to move them. The patient is sullen, morose, obstinate and taciturn; he resists, more or less strongly, everything that is done for him, and is fed and kept clean with much difficulty.

Cases of melancholia may, however, vary in a direction directly opposite to that of stupor, and instead of passivity, *activity* may prevail. The patient indeed is so restless that this type has received the designation. *Excited or Motor Melancholia*, or *Melancholia Agitans*. Than it, no form of mental disease is more distressing. Here the mental agony rises to such a height that it finds expression in muscular reactions. The unhappy patients may pace wildly up and down the room, as if endeavouring to escape from the terror which appals them.

Despair is depicted on their countenances. Sometimes they will tear at their throats, or pull out their hair till their scalps are bald; or they will tear their nails off, and pull pieces out of their flesh; or again, gnaw their lips and bite their fingers, or be perpetually picking them. They are usually very active in the expression of their delusions, which are all of the melancholic character, such as, that their souls are lost, that they are eternally damned, that they are to be tortured and executed, &c. &c., or they may be continually asserting their innocence of some imaginary crime.

Patients in this condition are almost always actively suicidal; to escape from the terrors which hang over them, they will, if possible, terminate their existence. They often refuse food in the most obstinate manner, with the deliberate intention of destroying themselves, and would indeed succeed in their endeavours were they not forcibly fed. A variety of this form occurs in which the patients are worked up into a perfect frenzy of panic and alarm; they rush wildly about the room, and are so completely possessed with terror as to be absolutely incapable of understanding anything said to them. In this state they may commit acts of violence of which they are quite unconscious afterwards when the panic has subsided. Such a condition seldom lasts long, but is liable to recur at different periods in the course of the case.

We have then six leading types of the affection under consideration:—(1) simple melancholia; (2) delusional melancholia; (3) hypochondriacal melancholia (a variety of No. 2); (4) stuporous melancholia; (5) resistive melancholia (a variety of No. 4); (6) excited or motor melancholia.

It must not be understood that the above are distinct forms of disease, they can scarcely even be said to be varieties. They blend one into another, and may at times all be illustrated in one and the same case in the course of its evolution. The names simply stand for groups of symptoms which are presented to us in practice, and which it is convenient to remember.

There are certain other points in connection with the mental condition of melancholiacs which require consideration.

It was mentioned at the outset that in the milder forms intelligence might be apparently perfectly retained, and especially that the memory might be quite

good. It may now be added that even in the severer forms in which distinct delusions are present, the patient, on ordinary topics unconnected with his delusions, may still appear rational, and his memory may still be perfectly retained, though this is by no means always the case.

But in proportion as these cases are receded from, either in the direction of mental stupor, or in that of mental agitation, grave impairment of memory, in addition to other mental defects, is commonly observed. This may, especially in stuporous cases, be due to incapacity on the part of the brain-cells to register new impressions; but it is frequently dependent upon want of attention, the patient being too much absorbed in his own misery to care for, or to take any notice of, surrounding things, and hence these pass to a great extent unregarded.

The suicidal tendencies observed in melancholia constitute an important feature of the disease. It would not be correct to say that every melancholiac is suicidal, but it is certainly the case that every such patient has the potentiality for self-destruction, and the immense majority exhibit such tendencies at some period or other of the case. The excited cases are probably on the whole most prone to suicide; but the tendency is present in many cases of simple melancholia. Occasionally suicide is directly dependent upon auditory hallucinations, the patient hearing voices commanding him to kill himself.

Though melancholia, as a rule, constitutes a more or less well-marked clinical entity, a melancholic condition is frequently merely a stage in the development of other mental disorders; thus it very generally precedes an attack of mania, and sometimes ushers in general paralysis, or is associated with this disease throughout its course.

The *physical condition* of melancholiacs has been alluded to when describing the simple form of the affection, but it requires more detailed consideration. The weakness of the circulation is most pronounced in stuporous cases, in which the extremities may be constantly cold and livid, and even œdema of the feet is not uncommonly observed. There is marked slowness of the respiratory rhythm. More or less insomnia is almost invariably in recent cases, and sleep is often wanting in proportion to the severity of the attack. The digestive functions are very generally disturbed, and the gastric

trouble is often an important factor in the disease. The tongue may be dry and thickly loaded with fur, the breath offensive, and the bowels confined; and along with this there may be total lack of appetite and great difficulty in administering food.

This condition may be either a cause or a consequence of the melancholic state. In some cases probably, the gastric derangement may actually precipitate an attack of melancholia which may pass off when a healthy condition of the gastro-intestinal tract is restored. But more commonly the derangement has its origin in the general lack of nerve force which has been shown to be so widespread a feature of the disease, or it is dependent upon the refusal of food which is so common in these cases. The stomach always becomes much disturbed in fasting cases. The refusal of food may itself be due to the general apathy and torpidity, or it may be the result of a deliberate resolve on the part of the patient to go without sustenance in order that he may starve.

The nutrition of the whole body suffers, and the patients almost invariably lose weight. Trophic lesions of the nails and skin are not unfrequently observed.

In women menstruation is usually suppressed, though in a prolonged case it very generally reappears even though there be no improvement in the mental condition.

Etiology.—Melancholia may occur at all periods of life from youth to old age, but it shows a special preference for the epoch of middle life.

Any cause which depresses the general health, or any mental shock, may act as the exciting cause of an attack. Thus melancholia is common in women who have been exhausted by prolonged lactation, and it is not infrequent in pregnancy and the puerperal state. Losses in business, domestic bereavement, grief and anxieties of all kinds operate powerfully in producing the disease. Drink is also a frequent cause. But it is not every brain which has the capacity for developing melancholia however unfavourable may be the conditions of the environment. For the exciting cause to be operative there is needed a predisposing cause, which is to be found in most cases in the inherited cerebral constitution.

Hereditary tendency is obvious in a large proportion of cases and exists in many others in which it cannot be traced. By hereditary tendency is to be understood not merely the direct transmission

of insanity, but the existence in the ancestral tree of any form of neurotic taint including alcoholism.

Pathology.—This is in many respects obscure, but a few facts may be noted. In death from acute melancholia, the cerebral changes to be observed are slight. In the recent forms there is commonly evidence of excess of blood in the cerebral cortex, the surface of the convolutions frequently presenting a more or less diffused patchy pink staining, and there being in places congestion of the deeper layers of the cortex. In the chronic forms the brain may appear absolutely normal to the naked eye, or there may be nothing noticeable beyond a little unusual pallor.

The chief *microscopical change* observed by the writer has been the presence in excess of the so-called "fuscous degeneration" in the brain cells, these being more or less filled with clusters of yellow granules. This change, however, is by no means confined to melancholia. It is met with extensively in dementia, and occurs normally to a slight extent as age advances. It appears to connote a defective power of energizing on the part of the brain cells, and hence when occurring to any extent in early adult age, it must be looked upon as distinctly pathological.

There can be little doubt that in melancholia the brain cells, from some inherent or acquired defect, are incapable of appropriating sufficient nutriment to admit of their discharging in the normal manner, and that the tension of nerve force is exceedingly low.

The melancholic diathesis, indeed, connotes a perennial difficulty in keeping up the brain nutrition to the proper standard and a great liability for it to fall below the minimum of working power upon the occurrence of the least adverse change in the environment.

The pulmonary lesions in melancholia are important. As might be expected from the slowness of the respiratory rhythm and the general immobility of these patients, a large number of them fall victims to phthisis, which is indeed the most common cause of death in this disease. Occasionally, indeed, phthisis precedes the mental disorder and acts as its cause. It is, moreover, very common, especially in the acute cases, for a low form of pneumonia which is very fatal to be developed. Actual gangrene of the lungs is also not unfrequently noted, either as a primary affection, or as a sequel to the pneumonia just mentioned. It has appeared to the

writer that this is sometimes occasioned by minute particles of food passing into the larynx and getting drawn into the smaller bronchi, in cases in which there is much difficulty in administering food, and when, as often occurs, the food is retained for a long time in the mouth and back of the fauces before it is swallowed. Pulmonary disease may develop in a very insidious manner, and all the ordinary symptoms may be latent until the fatal termination is within sight.

The occurrence of organic disease within the abdomen is much less frequent. It appears, however, occasionally to occur in direct association with the melancholic state, and visceral delusions seem to have thus at times a visible origin, but it is much more common for these latter to exist with abdominal organs apparently perfectly healthy.

Diseases of the uterus and its appendages, such as prolapsus, tumours, &c., are not uncommon, and occasionally stand in a causal relation to the disease.

Terminations.—(1) *Recovery.*—This is by far the most common termination, especially in the simple forms of the disease. The great majority of the cases that recover do so within a year from the first onset of the symptoms.

(2) *Death.*—This occurs in various ways. It may result, especially in the acute forms, from sheer exhaustion of nerve power, all the residual stock of nerve force being used up and collapse ensuing; or it may be, and frequently is, occasioned by some intercurrent affection such as pneumonia or phthisis, to which the low nervous vitality of these patients renders them peculiarly prone. Or, again, it may be the result of suicide.

(3) *Chronic Melancholia.*—This is merely a chronic form of the acute affection. Although it occasionally issues in recovery, the more usual course is a gradual lapse into the following state.

(4) *Dementia.*—This is simply mindlessness of greater or less degree, and is the goal towards which all forms of insanity tend. At times it is a somewhat rapid sequel to the acute forms of the disease; but it is more usually of slower onset and of less degree of intensity than when it occurs in succession to other kinds of mental disease.

(5) *Mania.*—A few cases terminate in subacute or chronic mania. That is, after melancholia has lasted a few months, a year or more, the character of the symptoms entirely changes, maniacal excitement is developed, which lasts a variable

time, and from this the patient, as a rule, gradually lapses into fatuity.

Prognosis.—This is good in proportion to the youth of the patient, the suddenness of onset, and the absence of well-marked hallucinations and delusions. It is unfavourable according as the reverse of these conditions obtains. Persistent refusal of food and loss of body weight are bad signs. The severer forms of melancholia agitans are unfavourable, especially if the excitement be long continued. Cases of deep melancholic stupor frequently make excellent recoveries. The longer a case lasts, the less chance there is of permanent recovery.

Treatment.—It is of no avail to attempt to argue a patient out of his delusions, or to point out to him that his hallucinations are purely subjective phenomena. Attention should be concentrated upon removing the condition of brain upon which the morbid feeling depends, and the intellectual defects will usually disappear *pari passu*. The first and most obvious indication is to endeavour to improve the general health and restore the exhausted nerve force by abundance of fresh air, good food, and nervine tonics. In warm weather it is desirable for the patients to live as much as possible in the open air, without, however, fatiguing themselves by too much muscular exercise. In the early stages the stimulus of foreign travel is at times highly efficacious, but a quiet rest in some suitable health resort is more beneficial to the majority of cases. Complete rest, indeed, with change of air and scene are the first requisites. Such measures will frequently suffice to restore a case which has not progressed far.

It is often quite unnecessary to send a patient of this kind to an asylum, provided he has sufficient means to ensure his being properly looked after; for the suicidal tendencies of melancholias should always be borne in mind, and it is never either safe or advisable to allow them to be by themselves. Hence, if sent from home, it should always be under suitable escort, and it is well to be very cautious in prescribing sea voyages, on account of the facilities thus afforded for the gratification of suicidal impulses. There is no question, however, that removal to an asylum is often productive of great benefit, the change to an orderly, settled life, and the subjection to discipline being highly efficacious in many cases.

Gastric derangements must be com-

bated by ordinary means. Refusal of food is often an exceedingly troublesome symptom, and one most difficult to treat. If obstinate it must be overcome by the use of the stomach-pump, and the patients must be forcibly fed two or three times a day with milk, meat extracts, liquid custards, &c. The food may, with advantage, be peptonized before administration. Stimulants are undoubtedly useful in many cases and should be given with food.

Insomnia is best treated by keeping the patients in the open air as much as possible—all day long if the weather be favourable, and the strength permit. Hypnotic drugs, such as chloral, morphia, henbane, &c., should be given with caution, as though they may be useful and desirable as occasional adjuvants, continued persistence in them has a deleterious effect on the nervous centres, and lessens the chances of recovery.

In some cases, especially those in which much stupor is present, the continuous current applied to the head is productive of distinct benefit.

J. WIGLESWORTH.

MENIÈRE'S DISEASE (Labyrinthine Vertigo).—An affection characterized by sudden attacks of giddiness, preceded or accompanied by noises in one or both ears and deafness.

Symptoms.—The attack often commences quite suddenly with a buzzing or humming noise in one or both ears, usually more marked in one. This is soon followed by vertigo, which may be either objective or subjective, or the patient may experience a sensation of falling, generally in a forward direction, but sometimes backwards or to one side. He reels and clutches neighbouring objects, but rarely falls, though occasionally he may do so, or in severe cases may be thrown violently to the ground. There is some doubt as to whether there is ever loss of consciousness, if so, it is only momentary, as the patient can always give an exact account of his sensations after the attack is over.

The attack lasts a few minutes, and passes off gradually, leaving the patient deaf and with noises in his ears. Towards the end of it, he is pale, with a cold clammy skin, and often experiences nausea or even vomits. Lateral nystagmus is sometimes present during the attack, and apparent movement of objects from side to side is complained of. Subsequent attacks are liable to come on at varying intervals and are generally

announced by an increase in the tinnitus, which is usually more or less permanent. A shrieking or a whistling noise is a common precursor of an attack. The intervals between the attacks gradually become shorter until the patient is reduced to a state of permanent vertigo, liable to exacerbations. The deafness gradually becomes more marked, and the tinnitus less prominent, and, finally, in some cases a spontaneous cure is effected when the deafness becomes absolute, the vertigo then disappearing.

Vertigo, tinnitus and deafness when united in one person generally indicate an affection of the labyrinth either from actual disease—*e.g.*, inflammation or hæmorrhage—or from disease of the middle ear causing pressure on it, but obstruction of the Eustachian tube or of the external auditory meatus, as by the accumulation of cerumen, may lead to the same symptoms.

Some writers do not regard Menière's disease as a severe form of labyrinthine vertigo, but as a distinct affection. According to this view, it is characterized by a sudden and severe attack such as that above described in a person who had no previous ear disease. The attack may never recur, it is nearly always confined to one ear, the deafness is extreme, the tinnitus and giddiness diminish or cease after the attack, and there is no evidence of disease of the middle or external ear. In labyrinthine vertigo, on the other hand, there is usually pre-existing ear disease, and severe tinnitus, with more or less deafness, the attacks are less sudden and more frequent, the giddiness is less severe but more chronic. Fagge believes that in true Menière's disease there is no affection of the labyrinth or cochlea, but some disturbance of the centres for hearing and equilibrium.

Treatment.—During the attack the patient should maintain the recumbent position, and may suck ice if there be much nausea or sickness. Bromide of potassium in 20-grain doses is sometimes useful. In the intervals any ear disease should be treated and the general health improved as far as possible. Quinine in large doses has appeared to do good, and electricity has also been recommended.

JOHN ABERCROMBIE.

MENINGES, CEREBRAL AND SPINAL, DISEASES OF.—The following affections are described under this heading:—

ACUTE CEREBRAL AND SPINAL MENINGITIS—

1. Tubercular meningitis.
2. Simple meningitis.
3. Leptomeningitis infantum.
4. Epidemic cerebro-spinal meningitis.

CHRONIC MENINGITIS—

Hæmatoma of the Dura Mater (Pachymeningitis hæmorrhagica).

Chronic hypertrophic pachymeningitis of the Cord.

ACUTE CEREBRAL AND SPINAL MENINGITIS.—An acute inflammation of the membranes of the brain and spinal cord.

Inflammation of the dura mater is termed pachymeningitis. Inflammation of the pia-arachnoid is known as leptomeningitis.

Varieties of the disease are recognized according to their intensity, duration, nature, seat and origin. Purulent and tubercular meningitis affect the pia mater almost exclusively, but tubercles may be seen on the visceral surface of the dura mater of the brain and cord. Tubercular meningitis is the most common form of brain disease in children. Infants a few weeks or months old are liable to a form of simple, non-tubercular meningitis which is called "occlusive," "posterior" and "leptomeningitis infantum."

1. Tubercular Meningitis.—*Symptoms.*—These are mainly due to the irritation and destruction of those parts of the brain and cord which happen to be affected, but doubtless many of the symptoms may be termed pure neuroses; at puberty hysterical neuroses are often the first symptoms of tubercular meningitis.

Premonitory symptoms are very frequent in children. A history of emaciation, poor health, vomiting, headache, lassitude, fretfulness, altered temper, capricious appetite, irregular action of the bowels, and pyrexia are some of the symptoms; they may be met with in various combinations, but are often so vague that they give no clear indication of the nature of the illness. This period may last from a fortnight to three months or longer. In some cases in children and in many cases in adults no premonitory signs may be observed, or the symptoms have been set down to a "cold" or to existing phthisis.

The symptoms of the actual illness have usually been arranged in three categories representing three periods, but in

practice the variations observed in the clinical course are very wide.

The first or *stage of irritation* is characterized by vomiting, which may be frequently repeated and "causeless," having no special relation to the ingestion of food. There is fever of an irregular remittent type, the temperature not usually rising higher than 102° , but the curve may be inverted—i.e., the highest temperature may occur in the morning instead of the evening. The pulse is usually increased in frequency, but the rate may be unaltered or slower than the normal. When the pulse is slow, vomiting is more common. The respiratory rhythm may show similar changes, and the breathing may be attended with a moan or groan. The bowels are constipated even when there is no vomiting.

Not only is there evidence, as just stated, of perturbation of the functions whose centres are seated in the floor of the fourth ventricle, but mental, motor, vaso-motor, and sensory symptoms may be noted, and are doubtless due to disordered action of those regions of the brain which subserve such functions. Severe headache, a tender hot scalp, fretfulness, headache, restlessness, sleeplessness, twitching and rigidity of muscles, tremors, squinting, contracted or unequal pupils, delirium, losses of consciousness, epileptiform attacks, hyperæsthesia of the various senses are some of the principal symptoms. Transient paralysis, such as ptosis or hemiplegia, may be noted, and may be simply neuroses.

In the *middle or transitional stage* the "irritative" phenomena tend to subside; drowsiness, low temperature, persistently slow and irregular pulse, irregular respiration, and a general apathetic tendency supervene. The pupils become dilated, optic neuritis may appear or become more marked, the "hydrocephalic cry"—a shrill shriek—may be heard. It indicates irritation, but is often present when the other symptoms indicate absence of irritation. The belly may become boat-shaped or concave, or simply flattened; the *tâche cérébrale ou méningitique* (of no diagnostic value) may be marked.

The *final stage* is but a further development of the paralytic or drowsy stage; collapse, convulsion, and coma are its leading signs. The pulse and breathing become again frequent, and often very feeble. Cheyne-Stokes' breathing may be witnessed—a series of respirations of increasing depth and frequency followed by a series of diminishing depth and

frequency, terminating in a period of apnœa, during which no breath may be taken for more than half a minute.

The typhoid state may develop, and is marked by a dry, brown tongue, low muttering delirium, sordes on the teeth and lips, picking at the bed-clothes, subsultus tendinum, and great prostration. The delirium and picking at the bed-clothes may be absent, coma and paralysis being profound. There may be no pyrexia, or the temperature may sink to 94° , or rise to the hyperpyretic degree as death supervenes.

Duration.—This varies, but many cases die within a fortnight of the commencement of the attack; the duration of the different stages is also variable.

Diagnosis and Treatment are considered at the end of the article on MENINGITIS.

Prognosis.—The disease is generally fatal, but good grounds exist for believing that recovery does rarely occur; when the termination is favourable it cannot be ascribed with any certainty to the use of any special method of treatment.

Pathology and Morbid Anatomy.—The inflammation is excited by the presence of tubercles in the meninges; the tubercles are developed chiefly along the distribution of the middle cerebral artery. Sometimes, however, no milary tubercles can be discerned, even in cases in which phthisis or tuberculosis exists elsewhere.

A gelatinous turbid, but never purulent, infiltration of the loose meshes of the pia mater is present most abundantly about the base of the brain, and along the Sylvian fissures; the sulci elsewhere may rarely show a considerable amount of infiltration. There is an excess of fluid within all the ventricles of the brain, and the fluid is usually turbid and contains leucocytes. The extreme anterior apex of the upper surface of the cerebellum almost always exhibits thickening of the pia mater; this thickening is evidently in direct continuity round the cerebral peduncles with that of the base, and the pressure of it on the venæ Galeni may be one cause of the ventricular dropsy (acute hydrocephalus).

When there is marked hydrocephalus the surface of the pia-arachnoid often feels dry and sticky, the sulci tend to be obliterated, and the convolutions are flattened by the increased pressure. The ependyma of the ventricles may show a granular shagreen appearance. The walls of the ventricles may be the seat of white softening; and when the ventricles are opened, the septum lucidum and

fornix may be ruptured. The tubercles may be detected in other parts of the brain than those supplied by the Sylvian arteries; sometimes they are localized in a part of one motor area on the convex surface and then typical attacks of Jacksonian epilepsy may have been observed. Around and near the tubercular foci capillary blood extravasations and thrombosis may be observed. There may also be larger nodules which may show caseation, and bacilli may be found in their substance.

Ætiology.—The causation of tubercular meningitis is the same as that of tuberculosis (*q.v.*), but various exciting causes such as blows and falls on the head, chills, excessive sunlight and heat, mental overwork and anxiety must be recognized.

2. **Simple Meningitis.**—*Symptoms.*—The number and combination of symptoms and the clinical course of this variety of meningitis have a general resemblance to the tubercular form, but the prodromata are usually absent; a differential diagnosis between the two varieties may be impossible, owing to the fact that either form may be markedly erratic in its mode of origin, course and progress. Any nervous symptom and any combination of symptoms may appear.

Headache, delirium, convulsions, vomiting, optic neuritis, hyperæsthesia and mental apathy, with retraction of the head are common symptoms. Convulsions are said to be more frequently present, and to be more dominant symptoms in this form of meningitis; this is probably true only when the motor area is most involved.

Duration.—The clinical course of this affection is, as a rule, shorter than in the case of tubercular meningitis. Death may occur in a few days, fulminating varieties being described in which the symptoms precede death by only a few hours or a day or two. In the case of an infant aged four months, observed by the writer, convulsions lasting two hours were the first and last signs of a purulent cerebro-spinal meningitis.

Pathology and Morbid Anatomy.—There is no special predilection for the base of the brain, the products of inflammation being often most abundant on the vertex; the material exuded is frequently purulent, spotted hæmorrhages and thrombosis of veins may be noted as in tubercular meningitis. It is not uncommon to find the whole brain and cord coated with an even layer of green pus which is

beneath the pia-arachnoid membrane; the fluid in the ventricles is often purulent also.

Ætiology.—Most cases of meningitis occur in children under the age of puberty, illustrating the doctrine that growing tissues are more prone to disease than finished organs, even when the exciting causes are the same.

The causes are numerous and difficult to group, they include blows and falls on the head, sunstroke, local and general pyæmia, as in disease of the bones of the middle ear and skull generally; facial carbuncle, necrosis of the jaw, erysipelas of the face and scalp, acute specific fevers—typhus, typhoid, measles, scarlet fever; pleurisy and pneumonia, and syphilis.

The association of pus over the brain with pus over the pleura, pericardium and peritoneum has been noted several times. Granular and large white kidneys have been associated with meningitis. Inflammation may extend from the skull to the meninges; simple or syphilitic caries or necrosis of any part is liable to be followed by meningitis, caries of the petrous portion of the temporal bone is perhaps the commonest. In suppurative disease of the nose and orbit the mechanism of the meningitis which sometimes results is of the same kind. Otitis without bone disease is frequently found with meningitis, but the sequence of events is uncertain. Otitis may be cause, consequence or companion of the meningitis.

For *diagnosis and treatment* see end of article.

Prognosis.—This is serious, but least so in the traumatic cases. The early supervision of deep coma is rarely followed by recovery. The less severe and acute the symptoms the better is the chance of recovery. Recovery may be slow and lingering and yet finally perfect; occasionally it is rapid and complete. It is, however, only in exceptional cases that health is fully restored.

Leptomeningitis Infantum.—This variety of simple meningitis deserves a short separate notice because of its peculiarities.

Symptoms.—These are few in number, as the symptoms of any form of meningitis are apt to be in very young infants. The disease occurs during the first months of life. As a dominant symptom cervical opisthotonos (retraction of the head) is most important. Optic neuritis is rare.

Prognosis.—This is less serious than in most forms of meningitis; a few cases

recover, some end in chronic hydrocephalus.

Morbid Anatomy and Pathology.—The region affected is the posterior part of the base of the brain, whence the names "posterior" and "basilar." The under surface of the cerebellum is glued to the posterior fossa of the skull and to the posterior boundaries of the fourth ventricle, thereby shutting up the foramen or foramina of Magendie, by means of which the cerebro-spinal fluid communicates with the sub-arachnoid space and the cerebral ventricles. This occlusion leads to the development of hydrocephalus and gives the disease its other name, "occlusive" meningitis.

Etiology.—Syphilis is one of the causes of this affection; for others the reader is referred to the article on MENINGITIS. Otitis without bone disease is believed to be a common cause.

Treatment.—Daily inunction of blue ointment into the back of the neck is a useful measure.

4. **Epidemic Cerebro-spinal Meningitis.**—*Symptoms.*—There are a few symptoms of meningitis which occur more frequently in this than in the other forms. The severity of the pains in the limbs and trunk may be ascribed to the irritation of the posterior nerve roots. The prevalence of cutaneous eruptions, apart from the cerebral maculæ, is a noteworthy feature. Erythemata, urticaria, herpes and purpura may be noted alone or in combination. The onset is usually sudden, with chills, high fever and vomiting. Deafness is apt to remain after the disappearance of all other symptoms, and headache is sometimes a sequela. The deafness is occasionally accompanied by a difficulty in maintaining the body equilibrium; both symptoms may be due to effusion into the labyrinth. Pneumonia is a rather frequent complication.

Duration.—The average duration is about two weeks; it sometimes lasts much longer, even some months. In two such cases a collection of pus was found beneath the cerebellum; the clinical course resembled that of abscess of the brain.

Prognosis.—If deep coma intervene within a week of the onset of the illness recovery is almost unknown. Still the prognosis is less grave than might be expected from the nature of the illness, and the case should never be abandoned as hopeless.

Morbid Anatomy and Pathology.—The inflammatory products are often puru-

lent, the changes are much the same as those found in simple meningitis.

Ætiology.—The disease is believed not to be contagious, or only slightly so; it most frequently affects young males under the age of twenty; it is epidemic; the actual cause may be an organism like that supposed to cause malarial fevers.

Diagnosis of all Forms of Acute Meningitis.—Brain symptoms like those occurring in meningitis may be due to altered blood states in any severe illness. In children brain symptoms are very frequent and marked. Definite signs of local paralysis may not be present in meningitis. If these considerations be borne in mind, no wonder need be expressed that a correct differential diagnosis is sometimes most difficult and even impossible. Typhoid fever sometimes mimics meningitis by causing constipation and a retracted belly. Tuberculosis may give rise to abdominal symptoms—tympanites, rose spots, delirium, pea-soup stools, large spleen—very like those of typhoid fever. The concurrence of headache with delirium is held to be diagnostic of meningitis; in fevers headache subsides as delirium comes on.

If there be disease of the middle ear, purulent meningitis is most probably present. If phthisis exist, or scrofulous scars, or hip-joint disease, or vertebral caries, the diagnosis should be tubercular meningitis; but with any of these affections hysterical symptoms may occur resembling those of meningitis. Under the age of one year tubercular meningitis is rarer than after that period.

Choroidal tubercle may be noted during life.

It is not always possible to diagnose abscess of the brain from purulent meningitis; nor crude tubercles or other "coarse" brain lesions from tubercular or simple meningitis. Since meningitis may commence its clinical course with hemiplegia, with epileptic fits, with signs like those of delirium tremens or even like those of uræmia, the question may arise whether the case is not one of these latter affections.

The occurrence of skin rashes in meningitis sometimes causes a resemblance to rheumatic fever, and this the more so since multiple arthritis has been noted in alleged cases of epidemic meningitis.

Severe lumbago sometimes suggests small-pox, which also begins suddenly with high fever, chills and headache; but the supervention of muscular rigidity

is special to meningitis. Meningitis may arise as a complication of the specific fevers, of inflammation and blood poisoning, thus increasing the difficulties of diagnosis.

Treatment.—If the meningitis be secondary to disease of the middle ear, surgical treatment of the latter affections may still be advisable, if only for the reason that many of the symptoms may be due to the condition of the ear.

The nature and the seat of the meningitis have but little influence on the treatment.

Powerful antiphlogistics, strong counter-irritants, blood-letting, severe purging and free blistering are measures which should be avoided. Absolute rest for the mind and body in an agreeable apartment is essential, the chamber being so situated that quiet and darkness can be obtained. It should be well ventilated, and kept at a temperature of about 60° to 65° F.

The bowels should be kept regularly open by simple means. The diet should be digestible and nutritious. Stimulants should be prescribed only when the state of the pulse and breathing indicates their use. Ice-bags or cold applications may be applied with advantage to the shorn scalp to relieve headache, vomiting, insomnia and mental or muscular restlessness. The same symptoms may be abated by the use of bromides, chloral, hyoscyamus, paraldehyde, sulphonal or opium. Injections of cocaine or morphine may be used to relieve pain. Leeches behind the ears may be employed with advantage if there be great heat of head and circulatory excitement. Iced or effervescing drinks, or, rarely, hot drinks, may relieve vomiting. Saline purges may reduce the cerebral and circulatory tension.

Mercurials may be employed to the extent of just "touching the gums;" the most useful preparations being calomel and grey powder in small doses. Iodides and mercury are useful to promote the absorption of inflammatory products, and they may be used at the termination of the acute stage, and with this object in view in cases which are more sub-acute and chronic. The limbs and trunk may be kept in good condition by shampooing and warm ablutions during the period of convalescence and during the treatment of chronic cases. The inunction of iodoform ointment into the scalp in cases of tubercular meningitis is valueless.

CHRONIC MENINGITIS.—This chiefly affects limited parts of the brain or cord, and generally leads to adhesions between

the pia and dura mater. The disease often occurs in the form of chronic hypertrophic pachymeningitis. Its pathology is a matter of contention; when the cerebral meninges are affected, the condition has been described as hæmatoma of the dura mater. Some authorities believe that the meningitis precedes the extravasation of blood, others teach that blood is first extravasated, and that this sets up meningitis and leads to fibroid formation.

Hæmatoma of the Dura Mater (*Pachymeningitis Hæmorrhagica*).—*Symptoms.*—These are by no means unequivocal. Epileptiform or apoplectiform attacks, headache, a full, slow pulse, drowsiness, contracted, dilated or unequal pupils, coma and convulsions, and slight hemiplegia have all been noted. It may be stated that there are no symptoms distinctive of the affection.

Duration.—The clinical duration of the disease is variable. Death may result soon after the occurrence of an epileptiform or apoplectiform attack, or the subjects of the disease may have been long resident in an asylum.

The *diagnosis* is exceedingly difficult. In cases of chronic syphilitic meningitis the diagnosis rests on the following points and is often easy. A history of syphilis, physical evidences of this disease in other parts of the body, unequal and irregular distribution of paralysis of cranial nerves and occurring frequently on both sides of the body. Of course, headaches, giddiness, vomiting, impairment of sight with optic neuritis, or atrophy, may be present as with any kind of meningitis. In one case, for example, the right seventh nerve was paralysed, its muscles wasted, and the faradic reactions lost; there was right hemiplegia of the graduated kind, with paralysis of the left external ocular rectus, and hemiatrophy of the left half of the tongue. The necropsy revealed a gumma on the right facial nerve at its superficial origin, and one on the left hypoglossal nerve; the left sixth nerve was compressed by thickened meninges. There was also thrombosis of the left Sylvian artery and wasting of the motor convolutions.

The *prognosis* is as variable as the duration.

Morbid Anatomy.—The pia mater and dura mater are bound together by the products of the disease. The lesions are usually unilateral and most marked over the convexity of the brain. Recent blood extravasation or brick-red or ochre-yellow discoloration is found in or between the new-formed membrances. There are

superimposed layers of membrane on the inner surface of the dura mater. These are soft and vascular when recent; but tough, white or brownish and fibrous when old. The hæmorrhage takes place into the sub-dural space; the affection is sometimes bilateral. The membranes on this view result from condensation and organization of the blood clot. Virchow's view is that membranes are formed one within another, and that they contain thin walled capillaries which burst and yield blood—a condition to which the term pachymeningitis hæmorrhagica is applied. The layers are often so arranged as to form cysts which may enclose a serous fluid, and then the disease is a form of external hydrocephalus. Cysts may also develop in the substance of the brain as the result of hæmorrhage into it; this is also a form of hydrocephalus externus.

Chronic meningitic thickening may be associated with syphilitic arteritis as well as with atrophy and sclerosis of the brain. Gummata may be found on the cranial nerves, aneurysms on the cerebral arteries, and thrombosis of the vessels may be present.

Etiology.—The disease is most frequently observed in men of advanced age, especially in those who have been hard drinkers. Alcohol and syphilis are recognized causes; insanity is often associated.

Treatment.—Anti-syphilitic treatment should be tried in all cases.

Chronic Hypertrophic Pachymeningitis of the Cord.—This disease usually affects the cervical enlargement of the cord.

Symptoms.—Exceedingly severe "root" or "radicular" pains shooting down the arms and neck are the most important early symptoms; anæsthetic areas may be found on the arms, shoulders, or neck. Amyotrophy of these regions subsequently supervenes; weakness of the trunk and legs usually occurs later, and is associated with rigidity of the affected muscles, and the phenomena of hyperkinesis, exaggerated knee jerks, ankle and rectus clonus, and front-tap contraction.

Any sensory, vaso-motor or motor symptom may be noted in the arms; sometimes they are pale and cold, at others blue and cold, and they may, however, be hot, burning, and sweating, or there may be sweating without any flushing. Eruptions may appear along the path of the lightning pains. Spasms may occur in the limbs, and a claw-shape of the hand may appear as the result of the wasting of the muscles supplied by the ulnar

nerve, which comes from the lowest part of the cervical cord. The pupils may be contracted; they may not dilate when they are shaded nor when the cervical skin is pinched or faradized.

The disease begins insidiously, and slowly advances in the course of months, the hyperæsthesia and pains being the first symptoms.

Duration.—The affection usually lasts from one to two years or even longer.

Diagnosis.—This has to be made from amyotrophic lateral sclerosis, sub-acute spinal atrophy and from progressive muscular atrophy but none of these diseases are accompanied by the agonizing pains and sensory disturbances which mark the affection under consideration. In an advanced stage rheumatoid arthritis of both shoulders may be simulated, owing to the existence of pains and amyotrophy, but grating in the joints does not occur as a rule in meningitis. The simultaneous onset of severe sensory symptoms in both arms is an important element in the diagnosis of meningitis of the brachial enlargement. The absence of pain is the most conspicuous feature of myelitis. The presence of pain and muscular spasm are the most conspicuous features of meningitis as contrasted with myelitis. A limited area of anæsthesia on the trunk or a limb is almost always due to meningitis.

Prognosis.—This is always grave and nearly always devoid of hope.

Morbid Anatomy.—This consists in concentric laminated thickening of the dura mater with compression of the nerve roots and cord; the spinal marrow may be softened or diffuent; secondary degenerations may be noted above and below the seat of compression.

Treatment.—Iodides and mercury should be prescribed. Half-drachm doses of bromides, given frequently, sometimes relieve pain better than injections of cocaine or morphine. ANGEL MONEY.

MENOPAUSE (Change of Life).—The cessation of menstruation.

This event usually occurs at about the age of forty-five, but it may precede this age, or be postponed until a later period, without any detriment to health. The complete cessation of menstruation is often preceded by a period of irregular menstruation, known by women as the "dodging time." This irregularity, and the final stoppage of menstruation, is, as a rule, not attended with any disturbance of health. But in some cases it appears as if the cessation of the rhythmical in-

crease of vascular tension and accompanying loss of blood, which are parts of the menstrual process, in some way interferes with the normal vaso-motor tone, and in consequence vaso-motor disturbances occur. Women thus often complain of palpitation, chills, "flushings," "heats" and perspirations, occurring without known cause. The liability to these troubles sometimes lasts for two or three years after the cessation of the menses, but ultimately, and often in less time, these symptoms cease. During the "dodging time," the hæmorrhages which occur are sometimes excessive, or may be unusually prolonged, without there being any change in the uterus appreciable by the methods of examination known to us. Hæmorrhages from other parts, as from the nose, or from hæmorrhoids, may occur, and this at such intervals that the hæmorrhage may appear to replace the missing menstrual flow. The presence of fibroids in the uterus usually delays the menopause. When premature menopause is brought about artificially (by spaying) the same vaso-motor disturbances are apt to occur, as are noticed at the natural menopause.

Women are very apt to accept "change of life" as an explanation of almost any symptoms occurring between forty and fifty, and eminent authorities have taught that many diseases are prone to attack women at this epoch. Among these are vertigo, epilepsy, cerebral hæmorrhage, dipsomania, hypochondriasis, melancholia, flatulent dyspepsia, pseudocyesis (*q.v.*), obesity, gout, gall-stones. These are diseases prone to develop in advanced life; but there is no scientific evidence to show that they are more common at the menopause than in the years which follow it.

Treatment.—The vaso-motor disturbances which occur at the menopause are best treated by saline purgatives. If the patient be florid, and there be any pelvic discomfort, benefit will be found from leeches to the cervix uteri or inguinal regions. Hæmorrhages, so long as they do not make the patient anæmic, should not be checked. If they render the patient anæmic, they must be treated according to the methods usual for such hæmorrhage at other periods of life. The menopause should not without careful examination be accepted as a sufficient explanation of uterine hæmorrhage occurring in a middle-aged woman, for such hæmorrhage may be the first symptom of disease, the early detection of which is extremely important. G. E. HERMAN.

MENORRHAGIA.—An increase of the menstrual flow. The causes which lead to increased hæmorrhage at the normal times commonly soon induce hæmorrhage at times other than the normal period; such hæmorrhage is called **METORRHAGIA**, and to that heading the reader is referred.

MENSURATION.—The act of measuring. A means of physical diagnosis especially applicable in diseases and deformities of the chest.

The methodical examination of the chest concludes with mensuration, by which means the actual shape and dimensions of the chest as a whole, and the relative measurements of corresponding parts on the two sides, may be ascertained and recorded.

The instrument in general use for this purpose is the *Cyrtometer*, which consists of two lengths of soft metal united by a short piece of india-rubber tubing.

The centre of the junction is applied to the vertebral spine at the desired level, and the metal pieces are accurately moulded to the chest wall, and are marked where they overlap in the mid-sternal line on a level with the point of application to the spine.

The instrument is now removed and placed upon a large sheet of paper and a tracing taken of its outline. The antero-posterior, transverse, or other measurements are then determined.

In medical practice such records are chiefly of value in cases of pleurisy in the stage of effusion, or subsequently when collapse of the lung has occurred, and treatment is being directed to promote its re-expansion; also in cases of phthisis in the stage of quiescence, or arrest, when it is desired to ascertain the effect of climatic or other treatment upon the capacity of the chest.

It is necessary to bear in mind that the outline is that of the chest wall only, and that its shape will be altered by the development of muscle or the deposition of fat as well as by expansion of the lung, a source of fallacy which to some extent militates against conclusions derived chiefly from this method of examination.

By means of a tape the circumference of the chest can be determined, and differences on the two sides, either during expansion or in repose, can be determined by the use of single or double tape measures.

For the detection of sub-clavicular de-

pression the trained eye is of more service than any instrument.

J. K. FOWLER.

MERCURY, Poisoning by.—The effects of the absorption of the salts of mercury are manifested in an **acute** and **chronic** form, the difference depending mainly upon the length of the period during which the poison has been gaining entrance into the system and the quantity absorbed.

Large doses of soluble salts of the metal administered at short intervals are likely to produce the train of symptoms which characterize the former affection, whereas chronic poisoning as a rule results from the administration of small doses of the less active preparations or from the inhalation of vapours charged either with the metal or its compounds.

Acute Poisoning.—The salt most frequently taken is the perchloride or corrosive sublimate.

The *symptoms* of acute mercurial poisoning are a metallic taste in the mouth, with constriction in the throat and an intense burning pain extending down the œsophagus to the stomach. The patient speedily becomes collapsed. The mucous membrane of the mouth becomes white and shrivelled; nausea and vomiting soon set in; the vomit may contain blood. Purging and griping pains in the abdomen, increased by pressure, will also be present; the urine is scanty or suppressed.

Fatal Dose.—A drachm of corrosive sublimate nearly always causes death.

Post-mortem Appearances.—The mucous membrane of the mouth and œsophagus is whitened; that of the rest of the alimentary canal more or less inflamed. Ecchymoses are common in the stomach, the cæcum and colon are inflamed and sometimes ulcerated, the kidneys are usually inflamed.

Treatment.—Vomiting must be promoted by the administration of such emetics as mustard (ʒss in water) or sulphate of zinc (gr. xx in water). It is generally recommended that the stomach pump should not be used. Albuminous substances, such as unboiled white of egg in water should be given in unlimited quantities, in order to render the poison inert; or, failing this, flour and water, arrowroot, or barley-water may be given freely.

Chronic Poisoning.—Mercurialization may manifest itself either by salivation or tremor. Salivation may result

from the medicinal use of mercury, tremor is only found in those exposed by their trade to the effects of the metal—*e.g.*, water-gilders, looking-glass makers, and barometer makers. In the former case the gums are swollen and recede from the teeth so that these may fall out; the breath has a peculiar fœtor; the amount of saliva is increased, and in bad cases the flow of it is incessant; the whole face may be swollen, and sloughing of the tongue or cheek may follow. In those who are the subjects of renal disease the chances of recovery are very small.

Mercurial tremor is preceded by a general loss of power; the trembling first shows itself in the arms, involving the legs at a later date; ultimately the sufferer is incapacitated from all employment; he cannot even stand alone; and his mental faculties undergo deterioration. There is usually also profound anæmia and a dark line along the gums.

Treatment.—The essential measure to attend to in all these cases is the removal of the exciting cause. Where the person is taking mercury internally, the medicine must be stopped. In a case of tremor, the patient must change his trade.

J. ABERCROMBIE.

MESENTERIC GLANDS, DISEASES OF.—The mesenteric glands are liable to acute and chronic inflammation, and to certain specific processes.

Acute Inflammation and Congestion.—Inflammatory conditions of the mesenteric glands are generally found associated with acute affections of the intestines; with catarrhal diarrhœa, cholera infantum, enteric fever, dysentery; it is in the two last named only (*q.v.*) that the condition is of importance.

Chronic Inflammation.—Chronic enlargement of the mesenteric glands may be due to chronic or often repeated intestinal catarrh, the glands may, in children, even undergo caseation (Hænoch).

Tubercular Disease.—Tubercular disease of the mesenteric glands is the most important affection to which they are liable; it is secondary to tubercular enteritis or peritonitis, exceptions to this rule are rare, and probably all more apparent than real. (*See LYMPHATIC SYSTEM, DISEASES OF; TABES MESENTERICA; TUBERCULOSIS.*)

Atrophy.—In old age and after enteric fever the mesenteric glands may atrophy. They not infrequently undergo calcareous degeneration, probably as a sequel to tubercular disease.

Malignant Disease.—The glands are liable to be affected secondarily in cancer of the intestines. Lymphadenoma may affect these glands, and in this disease they often attain a very large size.

METRORRHAGIA.—Hæmorrhage from the uterus—*i.e.*, hæmorrhage from the unimpregnated uterus, excessive in frequency, duration or quantity. It may arise from either general or local causes. Both are very numerous and include:—

1. *General.*—Hæmophilia; purpura; scurvy; phosphorus poisoning; acute yellow atrophy of the liver; Bright's disease; acute fevers, such as scarlet fever, small-pox, typhus, measles, &c.; diseases obstructing the return of blood from the uterus in a slight degree, such as heart, lung, or liver disease (these conditions in high degree lead to amenorrhœa); fatigue, over-exertion or excitement; residence in hot climates.

2. *Local.*—Among the most common local causes of hæmorrhage from the womb are fibroid tumours and polypi; endometritis; malignant diseases; retroversion and retroflexion; sub-involution; inversion; retained membranes or placenta; and disease of the uterine appendages.

Treatment.—The hæmorrhage is generally a symptom, and the cause must be sought for. In a virgin, or a patient who objects to examination, we must treat the symptom. No drug is comparable to ergot in its efficiency against uterine hæmorrhage, although there are many that have been recommended. If ergot fail, and the hæmorrhage, judged of by its effect on the colour of the skin and mucous membranes, be injuriously great, it is advisable to insist on an examination. If bimanual examination fail to detect a cause for the hæmorrhage, then it will be necessary to dilate the cervix and explore the uterine cavity.

G. E. HERMAN.

MICRO-ORGANISMS.—Among the micro-organisms or microbes of especial interest and importance in medicine are *Bacteria* and *Protozoa*. They belong respectively to the vegetable and animal kingdoms.

Bacteria at one time were included among the minute organisms which stand on the borderland between animals and plants. They are now considered to be vegetables, as they are able to derive their nourishment from ammonia compounds; but they differ from the higher

vegetable cells in being unable to split up carbonic acid into its elements, owing to the absence of chlorophyll.

Bacteria may be defined as minute vegetable cells destitute of nuclei. They possess a cell wall and cell contents. The cell wall consists of cellulose. Some bacteria are capable of bending and twisting, while others remain perfectly stiff; this depends on the property of the cell wall, which is either pliable or rigid. Of the cell contents, the protoplasm is in some homogeneous and in others granular, and varies in its microchemical reaction in different species.

The effect of the aniline dyes, which are employed to render the organisms more clearly visible, depends on the affinity of the protoplasm for dyes. Hence the different methods employed in the preparation of microscopical specimens. The protoplasm in some bacteria contains starch granules, which give the iodine reaction; in others it contains sulphur granules, and in others again certain colouring matters. In some cells, either as the result of secretion from, or absorption and swelling up of, the cell wall, a gelatinous envelope develops, and sometimes this forms a matrix in which numbers of bacteria are embedded—a *zoogloea* (Fig. 1).

Bacteria differ greatly in shape, but certain typical forms are recognized.

Spherical and egg-shaped cells are called *cocci* (Fig. 2). A coccus increases by fission, and if the resulting elements remain attached to each other, a *diplococcus* (Fig. 3) is formed. These may in turn divide, and if the resulting elements remain linked to each other, a *streptococcus* (Fig. 4) is produced. Streptococci vary considerably in length, sometimes consisting of only a few elements, and sometimes stretching right across the field of the microscope.

When a cell divides in two directions the four daughter cells form a *tetrad* (Fig. 6); and if, in addition, those elements divide in a third direction, eight elements result from the division of a single cell, and form a *sarcina-coccus* (Fig. 7).

A common form-type is the rod; a short rod is often distinguished as a *bacterium* (Fig. 8), and a long rod as a *bacillus* (Figs. 9, 10, 13, 14). The bent rod or *vibrio* is intermediate between the straight rod and the corkscrew rod or *spirillum* (Fig. 11).

There are also filamentous forms, which are distinguished as *leptothrix* if they are straight, or *spirochæta* if they

FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.



FIG. 5.



FIG. 6.



FIG. 7.



FIG. 8.



FIG. 9.



FIG. 10.



FIG. 11.



FIG. 12.

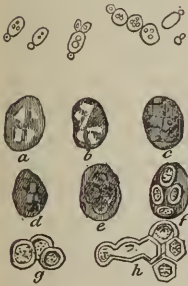


FIG. 13.

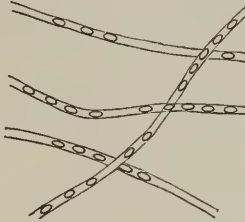


FIG. 14.

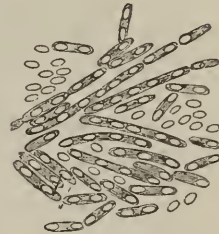


FIG. 15.

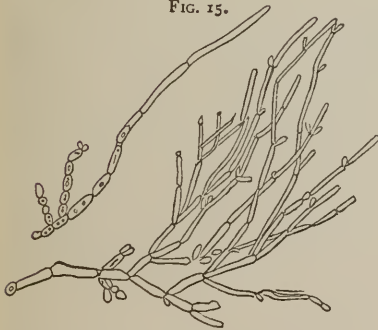


FIG. 16.



FIG. 17.



Fig. 1. Cocci in a mass or swarm (Zoogloea).

„ 2. Cocci singly and varying in size.

„ 3. Cocci in pairs (Diplococcus).

„ 4. Cocci in chains or rosaries (Streptococcus).

„ 5. Cocci encapsuled (Bacterium pneumoniae crouposæ).

„ 6. Cocci in groups of four.

„ 7. Cocci in packets (Sarcina).

„ 8. Bacterium termo.

Fig. 9. Bacillus lepræ.

„ 10. Bacillus malarie (after Klebs)

„ 11. Spirillum cholerae Asiaticæ.

„ 12. Torula cerevisiæ.

„ 13 & 14. Bacillus anthracis.

„ 15. Saccharomyces mycoderma, or Oidium albicans.

„ 16. Fungi of Favus.

„ 17. Penicillium glaucum.

From Crookshank's Bacteriology.

are of a wavy character. There is an unusual form, the result of a wavy filament becoming curled and twisted on itself, termed *spirulina*.

Bacteria may be divided into four classes according to their form-types:—

Sphero-bacteria, or globular forms (micrococcus);

Micro-bacteria, or short-rod forms (bacterium);

Desmo-bacteria, or long rods (bacillus, vibrio);

Spiro-bacteria, or spiral forms (spirillum, spirochæta).

This classification, however, is not scientifically correct, as these different forms are not constant for all microbes. The same species, if polymorphic, may exhibit several forms at different stages of its growth.

Some bacteria are motionless; others are endowed with locomotive power. By examining a drop of any putrefying liquid or vegetable infusion under the microscope, the peculiar characteristic movements of many species may readily be studied. Some appear to undulate; others glide along, or spin round like a top, or progress with a peculiar tremulous motion; others appear to move backward in one direction, then turn round and progress in another; others have a very characteristic corkscrew movement. The movement of micrococci is probably only brownian.

It is not fully explained how locomotion is effected. In some cases it appears to be due to the contractility of the protoplasmic contents of the cell. In others, movement is produced by a delicate lash-like filament, which may be present at one or at both ends of the micro-organism as in *Bacterium termo*. *Spirilla* are exceedingly active in their movements, and the flagella can be readily demonstrated by suitable methods of staining.

Bacteria reproduce their like by a very simple process, *division*. Hence they are called *fission-fungi*. A single cell increases in size, and a constriction takes place in the middle. This goes on until the two parts are divided one from the other. These new individuals may pass an independent existence, or remain linked together.

By another process representing true fructification, spores are formed. In the anthrax filaments, for example, under suitable conditions the protoplasm becomes granular, and a little speck appears which gradually increases, becomes highly refractive, and has a sharply

defined contour. It grows at the expense of the protoplasm, and develops into an oval spore. Finally, the sheath of the bacillus gives way, and the spore is set free. These spores have a thick investment, consisting of two layers. It is probably owing to this that they possess the property of retaining their vitality when dried, and also of resisting heat, chemical, and other agents to a remarkable degree.

It is because of the power of spores to resist destruction that outbreaks may occur again and again in a district which has once been infected with anthrax. Spores cannot be stained by the ordinary methods, but require special treatment, so that the dye may penetrate the tough capsule.

Bacteria, like all living structures, must be supplied with food. They require nitrogen, oxygen, carbon, water, and certain mineral salts. Access to free oxygen is necessary for some, but others can derive it from the oxidized compounds in the medium in which they grow. Nitrogen is necessary for building up the protoplasm of which bacteria consist. It can be derived from albumins or from ammonia and its derivatives. Carbon is derived from such substances as cane-sugar, milk-sugar, glycerin, and the splitting up of complex proteid bodies. Water is also essential to their growth.

In the laboratory various liquid media are employed for growing bacteria; chicken broth, beef broth, hydrocele fluid, liquid blood serum, milk, urine, decoctions of carrot, cucumber, turnip, or grape juice; or solid media, such as nutrient gelatin, nutrient agar-agar, solid blood serum, potatoes. All these media have to be rendered sterile, and precautions have to be adopted in carrying on the cultivations to prevent the access of foreign micro-organisms.

Nutrient jelly, for example, which usually consists of beef juice, salt and peptone, stiffened with gelatine or agar-agar, is prepared as follows:—First of all, the glass vessels and test-tubes employed in the process are thoroughly cleansed. Test-tubes and flasks are stoppered with a plug of cotton-wool, and then placed in the hot air chamber at 150° C. for an hour. All pre-existing micro-organisms in the cotton-wool and in the glass vessels are thus completely destroyed. In pouring the liquid jelly into the test-tubes there is danger of contamination with the germs in the air, therefore they must again be submitted to sterilization. They are placed in a

steaming apparatus for fourteen or fifteen minutes, on three or four successive days; the tubes containing the nutrient medium will then be perfectly free from any pre-existing organisms, and may be kept without change for any length of time. To inoculate the test-tubes an inoculating needle made of platinum wire fixed at the end of a glass rod is used. By holding the wire in the flame any organisms that may be upon it will be destroyed. In a few moments the wire is cool; it can then be dipped into the material to be examined. The cotton-wool plug is quickly removed from the test-tube, and by tracing the needle on the surface the bacteria are sown upon the jelly. In this way a series of cultivations of different species may be obtained.

When bacteria are grown in this way, very striking results are obtained. The bacteria may be divided into four classes, according to the effects produced on the media in which they grow. Living animals are included among these media, for inoculation affords a means of cultivating certain organisms, more particularly those which refuse to grow on any artificial nourishing soil.

The four classes are—

- The *Chromogenic*, or pigment forming;
- The *Zymogenic*, or fermentative;
- The *Saprogenic*, or putrefactive; and
- The *Pathogenic*, or those which produce disease.

The **Chromogenic** produce various colour stuffs. One of the most striking is the *Micrococcus prodigiosus*, which forms a blood-red growth in bread, potato, and other media. *Bacillus violaceus* produces a violet pigment, and *Bacillus pyocyaneus* a delicate green. The magenta micrococcus forms a brilliant magenta growth with a metallic lustre. In this species the pigment is retained within the cells. The surface of sterilized potato is a very favourable medium for the cultivation of the chromogenic groups.

The **Zymogenic** are those which produce fermentation such, for example, as the bacterium which produces acetic fermentation in wine. Owing to the growth of this organism the alcohol takes up oxygen and is converted into vinegar and water, $C^2H^6O + O^2 = C^2H^4O^2 + H^2O$. Other examples are afforded by the fermentation of urea and the conversion of sugar of milk into lactic acid.

The **Saprogenic** or putrefactive bacteria produce changes, very similar to fermentation, in complex organic sub-

stances. They are present in all putrefying substances. They abstract the elements they require for their growth, and the remainder enter into new combinations. Associated with these changes in media undergoing putrefaction, poisonous substances or *ptomaines* are produced.

The **Pathogenic** species are believed to be the active agents in producing certain diseases in man and animals, but before bacteria or other micro-organisms can be regarded as the contagia of disease they must fulfil the following conditions:—

(1) The micro-organisms or bacteria must be found in the blood, or lymph or diseased tissues of man or animal suffering from or dead of the disease.

(2) These micro-organisms must be isolated from the blood, lymph or tissues and cultivated on suitable artificial media, and these pure cultivations must be carried on through successive generations.

(3) Such pure cultivations must, when introduced into the living body, produce the disease in question.

(4) Lastly, in the inoculated animal, the same micro-organisms must again be found.

Statements that micrococci or bacteria are found in this or that disease are by themselves of little value. The bacteria must be isolated and successive cultivations carried on, and if on inoculation of a susceptible animal, the disease be produced, then and then only can they be asserted to be pathogenic. The bacillus of septicæmia in mice, for example, may be cultivated for several generations, and such a cultivation will reproduce the disease on inoculation. The tubercle bacillus may be cultivated in blood serum or glycerin-agar-agar, and a trace of such a cultivation will produce tuberculosis. And until some fallacy is pointed out in these experiments, we must accept as proven that the tubercle bacillus is the principal agent in the production of tuberculosis.

Another well-known pathogenic micro-organism is the *Bacillus anthracis*; this also may be sown in artificial media, cultivated for successive generations, and with an artificial cultivation the disease can be readily reproduced in any suitable animal. The bacillus grows readily on the potato, and the scraped-off growth may be mixed with sterilized water and silk threads impregnated into the spores. The silk threads may be kept for years, and the minutest portion introduced

under the skin of an animal will produce anthrax.

Nearly forty years ago the anthrax bacillus was discovered in the blood of animals suffering from splenic fever, but it was not until 1877 that Koch, by the methods of cultivating, clearly demonstrated that anthrax could be reproduced, not only by inoculation of blood containing the bacillus, but also by the isolated organism.

Chicken cholera and many different forms of septicæmia in rabbits and guinea-pigs are produced by bacteria. In leprosy, Asiatic cholera, relapsing fever, and in glanders, swine fever, swine measles, and other diseases in man, and in animals there are micro-organisms which are intimately related to these diseases.

In other cases, such as small-pox, scarlet fever, foot-and-mouth disease, cow-pox, sheep-pox, and pleuro-pneumonia, bacteria have been discovered and described as the contagia, but the evidence is most unsatisfactory, and in many instances entirely misleading.

There is a great fallacy in these investigations, which it is very necessary to bear in mind. In diseases in which there are lesions of the throat or intestinal canal, micro-organisms may get access to the circulation and be swept into the internal organs. The presence of these bacteria is all the more misleading in that some species, when isolated, cultivated and inoculated, may produce death in lower animals. The bacteria in such cases do not reproduce the disease from which they were isolated, but they produce symptoms which are frequently misinterpreted. If, therefore, from a disease an organism be cultivated which produces death in lower animals, the organism is not necessarily the virus of the original disease, as is proved by the fact that there are a number of organisms which can be isolated from healthy fæces, saliva, and other discharges which have this effect.

Several explanations have been suggested of the way in which bacteria produce their effects. In examining sections of tissues of animals which have died of anthrax, the small vessels and capillaries are sometimes found to be completely blocked by bacilli. Hence arises the mechanical theory; this, however, falls to the ground when it is found that far more frequently there are, comparatively speaking, very few bacilli present.

Another theory is suggested from

analogy to the putrefactive bacteria; the pathogenic bacteria being credited with the production of poisonous alkaloids or ptomaines. From the fact that bacteria are living bodies requiring nutrition, the theory has been suggested that they starve the tissues of their host. But if such were the case, death by a slow process would be expected, and it would be difficult to account for such acute symptoms as are present in anthrax.

That poisonous products are formed is very probable, but at the same time no one has satisfactorily demonstrated that these substances are elaborated by the pathogenic bacteria. Possibly the methods of detecting and isolating these poisons, are at the present time inadequate.

Protozoa.—Minute forms of animal life are found in the intestinal and other secretions, but there are others which are found occasionally in the blood of man and animals.

The peculiar bodies found in the blood in malaria are regarded as stages in the life-history of an amoeboid organism, and this constitutes the only instance of an animal micro-parasite credited with pathogenic properties. The malarial organisms or microbes of paludism were first observed by Laveran, a French physician in Algiers, who communicated his researches to the Academy of Medicine in 1881 and 1882, and published a work on this subject in 1884. Laveran described peculiar bodies, or *corps kystiques*, of two kinds, which he called Nos. 1 and 2, mobile filaments; and bodies called No. 3, or cadaveric forms.

The *corps kystiques* No. 1, or semi-lunar bodies of Laveran, are cylindrical elements with pointed extremities curved in the form of a crescent, and pigmented centrally. They are 8 to 9 μ in length, and 3 μ in width. They are transparent and colourless, and sometimes exhibit on the concave side the appearance of a very fine line uniting the extremities of the crescent, being in reality the edge of a delicate membrane.

Laveran also described oval forms which seem to be intermediate between Nos. 1 and 2. The pigment is often arranged in the form of a crown. These bodies are non-motile; several forms can be observed which vary in shape from the oval to the crescent. These forms are less numerous than the second kind, No. 2. The latter are spherical bodies in the interior of red blood cells and exhibit amoeboid move-

ments. They consist of a transparent hyaline mass enclosing pigment grains.

The mobile filaments are three or four times as long as the diameter of a red corpuscle. They are sometimes free and move about rapidly among the corpuscles, setting the latter in movement.

The observations of Laveran have been confirmed and extended by Richard, Marchiafava and Celli, Connalman and Abbot, Osler, Sternberg and Carter. Marchiafava and Celli have described more particularly a non-pigmented amoeboid form, or *plasmodium malariae*, and Golgi has described another stage, the "rosette" form.

These various forms are believed to be the different stages in the life-history of this singular organism. It has not been cultivated outside the living body. But its presence in the blood in malaria, and its disappearance after the administration of quinine, are considered as indicating a causal relation to the disease.

Flagellated protozoa have been found in the blood of equines suffering from a disease known in India as *Surra* (Evans, Crookshank). Similar, if not identical, bodies have been found infesting the blood of fish (Metrophanow), the hamster (Wittich, Koch), and rats (Lewis, Crookshank).

In stained preparations of the blood of animals suffering from *surra*, the somewhat tapering central portion or body of the parasite is continuous at one end with a whip-like lash, and at the other end terminates in an acutely pointed stiff filament, or spine-like process. By very carefully focussing the upper edge of the central portion the existence of a delicate longitudinal membrane with either a straight or undulating margin can be discovered. Owing to the somewhat curved and twisted shape of the parasite and the curling of the flagellum, it is difficult to make exact measurements, but the width varies from 1 to 2 μ , and the length of the body from 20 to 30 μ . The flagellum is about equal in length to that of the body.

Similar micro-parasites exist in the blood of common sewer-rats. These bodies are highly polymorphic. They present for the most part slightly tapering bodies which terminate at one end in a stiff, non-motile, acutely pointed flexible filament, or spine-like process, and at the opposite end are provided with a long flagellum, while, longitudinally attached, a delicate undulating fin-like membrane can be traced, which starts from the base of the posterior filament

and becomes directly continuous with the flagellum.

The monads in the rat, and the *surra* parasite are morphologically identical with each other, and both, as far as one can judge from mere description, are morphologically identical with the monad in the blood of the carp. These organisms may be conveniently termed *Trichomonas sanguinis*.

The organism in *surra* is believed by some to be pathogenic, but it has never been isolated from the blood and put to the test of inoculation. It is quite possible that the parasites in *surra* are only associated with the disease, the impoverished blood affording a suitable nidus for their development, while contaminated water may be the common source of the organism and the disease. On the other hand, the organism of the rat is found in apparently perfectly healthy, and in well-nourished animals.

EDGAR CROOKSHANK.

MICTURITION, Frequent, in the Female.—Irritability of the bladder, a common symptom in women, must be distinguished from incontinence of urine. The latter means that the urine cannot be retained, and is continually running away, a result either of a fistulous opening between the bladder and the uterus or vagina, of which injury and cancer are the common causes, or of abnormal patency of the urethra. This latter condition sometimes follows over-dilatation and laceration of the urethra. Incontinence of urine is suggested by the urinous smell of the patient's clothes, and confirmed by the fact that no urine is found in the bladder.

Irritability of the bladder implies that the patient cannot restrain herself from emptying the bladder sooner or oftener than she would like. In this case, although the patient complains that the urine runs away, some urine can be retained in the bladder.

This symptom is present in almost all diseases of the bladder and urethra (in connection with which one important fact to remember is that it may be an effect of retention), also in certain diseases of the kidney, and of the uterus or its appendages; in uterine displacements, in diabetes, and in disease of the spinal cord. It may be a reflex effect of almost any irritation of the pelvic organs. It is usually, as in the above-named conditions, a symptom to which a definite date can be assigned, but there are some women who, from infancy, have

been unable to retain the urine so long as most. Temporary frequency of micturition occurs at the menstrual period and during pregnancy, and is a frequent result of colds and coughs, and of diarrhoea.

Treatment.—The treatment will depend entirely upon the nature of the underlying cause.
G. E. HERMAN.

MIGRAINE (Megrim).—A typical attack of migraine readily admits of being roughly divided into two parts, the first consisting of the sensory phenomena and the second of the headache.

Of the former, none are so frequent or so impressive to the patient as the disorders of vision. A blurring of images on one side or the other is noticed, very much like that which is experienced after looking at the sun. It generally commences a little to the outer side of the centre of the field of vision, and spreads thence on the temporal side till it affects nearly one lateral half of the field. The outer boundary often acquires a zigzag arrangement, illuminated or not with the most gorgeous colours, and having the appearance of a rapid molecular, oscillating, or undulatory movement (teichopsia). On the inner side, however, the cloud is gradually clearing off, and thus the scotoma takes on a horse-shoe shape, with the concavity towards the centre of the field of vision. The clearing-up process continues until in from ten to twenty minutes from the commencement sight again becomes normal.

Affections of common sensation are frequent, and consist of a feeling of pins and needles or of numbness, sometimes followed by anaesthesia. They occur most frequently in one or the other arm, less often in the face, and very rarely in the leg. The affection is nearly always unilateral in the face and extremities, but bilateral when it attacks the mouth and tongue. When vision and common sensation are coincidentally affected, the hemiopic defect and numbness are on the same side.

Taste, smell, and hearing are very seldom implicated.

Aphasia is not at all uncommon, and varies from a simple difficulty in framing a clear sentence to complete loss of speech. It is usually associated with some degree of numbness, commencing as a rule in the fingers, and nearly always on the right side.

In the earlier part of the paroxysm there is sometimes a certain amount of

psychical disturbance, manifested by a confusion of intellect, temporary suspension of memory, or an unaccountable sense of fear.

Vertigo is not infrequent, and consists of the apparent revolution of surrounding objects or of the patient himself. It has been observed that a hemiplegic weakness sometimes occurs during the preliminary stage. The fact, however, that patients occasionally drop things they hold in their hands may possibly be explained by the loss of the muscular sense.

Any one or any combination of these sensory symptoms may initiate the full migrainous seizure or may exist alone, constituting a larval, or masked form of the disease. In the former case the headache supervenes in from ten to thirty minutes from the commencement of the attack, and, although it generally follows immediately after the sensory symptoms, occasionally the two appreciably overlap one another. It usually commences over an area which can be covered with the tip of the finger, and commonly radiates thence over both sides of the head, though in some cases it is distinctly one-sided. Frequently overwhelming in its intensity, and of a boring, stabbing or throbbing character; it is greatly intensified by exposure to light and noise, or by any movement.

It is generally markedly cumulative in its nature, attaining its maximum steadily or by leaps and bounds, and then gradually subsiding. During the acme of the pain, vomiting frequently occurs, in some cases inducing almost immediate relief, but in others the accompanying retching only increases the distress. The pulse rate is often reduced in the attacks, sometimes to 48-50.

Many affections of the sympathetic system have been described, but are very inconstant—*e.g.*, contraction and dilatation of arteries, retraction of eye, dilatation of pupil on the affected side, pallor and flushing of face. The duration of the seizures varies considerably in different individuals, and may be as short as two and a half hours, or as long as two and a half days. Xanthelasma palpebrarum and patches of grey hair are comparatively common in those subject to migraine.

Diagnosis.—No difficulty should arise in a fully developed case, but much care is sometimes required in differentiating some of the masked forms of the disease from dyspeptic headache, neuralgia of the fifth nerve, and even *petit mal*.

Prognosis.—No definite rules can be laid down; some cases are as easily curable as others prove intractable. Generally speaking the longer the disease has been in progress, the more severe the attacks, and the greater the number of special senses involved in the onset, the more difficult is the cure. It frequently happens in cases of gouty origin that with the first outward manifestation of gout the migraine disappears. As a rule the attacks diminish in intensity and number with increasing years, till they eventually disappear, in women about the time of the menopause.

Pathology.—It is only possible in this article to briefly notice a few of the many theories advanced. Most of them are based upon far too circumscribed a view of the disease; for instance, upon the by no means invariable presence of sympathetic symptoms no less than three theories have been constructed. One would explain the phenomena by a paresis of the sympathetic causing cerebral congestion; another, by a tetanic spasm in the territory of the cervical sympathetic, inducing exactly the opposite condition; the third ingeniously combines these two self-destructive theories and ascribes the sensory symptoms to a spasm of the cerebral vessels, and the headache to a subsequent dilatation. The fact, however, that sometimes the headache ensues before the sensory symptoms have ceased seems fatal to this hypothesis, since it would be impossible to get both constriction and dilatation at the same time. The frequency of errors of refraction and the observation that in some cases a bright light induces the paroxysm suggested the ophthalmic theory. Probably, however, the eye, though undoubtedly the most frequent, is only one of many points of departure of the disease.

Many considerations lead to the belief that migraine is a nerve-storm traversing the sensory centres and having a fundamental relationship with epilepsy, although differing so greatly in its outward manifestations. If this be so the discharging centres are probably of about the same level as those which in the motor region would give rise to epileptiform or Jacksonian convulsions.

In the present state of knowledge in regard to the position of the sensory centres, it would seem safer as yet not to attempt to localize exactly the seat of the lesion. It seems likely that there is a congenital deficiency of controlling power of one or more of the sensory

centres, and that if it be still further weakened by exhaustion or strained to the utmost by excessive stimulation or irritation of the lower centres, inhibition eventually breaks down altogether and a paroxysm occurs.

Etiology.—Heredity is the most potent predisposing cause of migraine. Sometimes it owns a gouty origin and occasionally a malarial. It is rather more common in women, and frequently commences at the age of seven or eight, seldom after thirty, but may start at any intervening age. Very often there is some defect of the visual apparatus, an error of refraction or some weakness of the internal or external recti. Mental or physical exhaustion, whatever may be its origin, is the most frequent exciting cause. Sometimes the attacks occur at the catamenial epochs, more rarely they follow upon some error of diet or exposure to a bright light.

Treatment.—This is directed towards two ends—(1) to diminish the frequency of the attacks, and if possible to prevent them altogether, and (2) to mitigate their severity.

The first indication, after treating any causal influence which may seem to be at work, is to prevent any unnecessary excitement, any over-exertion, mentally or physically, so as to procure for the patient an equable existence. The encouragement of a "healthful life, a healthful growth and healthful education" is of the very first importance in the young. In all cases the diet should be liberal, the bowels carefully regulated and moderate exercise encouraged. The most useful of the many drugs recommended are the bromides, alone or in combination with quinine, strychnine alone or combined with ergot, cannabis indica, iron, arsenic, cod-liver oil, belladonna and hyoscyamus. Occasionally iodide of potassium and chloride of ammonium are very useful. Patients having a gouty history are treated successfully with alkalies.

During the paroxysm the patient spontaneously retires to a dark room and seeks absolute quietude. If the feet be cold they should be wrapped in blankets or immersed in hot water, with some mustard added. A cup of strong tea or coffee is often now of use. In some cases antipyrine, preferably effervescent, in doses of 10 to 20 grains is able not only to diminish the severity of the attacks, but even to abort them, if given at a sufficiently early stage. Guarana and caffeine have a similar effect in some

cases, but are quite useless in others. Hydrate of chloral in doses up to 20-30 grains is frequently successful by inducing sleep.

Other less generally useful remedies are ergot, nitrite of amyl, nitro-glycerin and the constant current passed from one mastoid process to the other.

WM. GAY.

MOLLUSCUM.—This name has been given to two distinct and dissociated diseases of the skin, owing to a fancied resemblance in their lesions to some molluscs.

MOLLUSCUM CONTAGIOSUM (*Molluscum Sebaceum*; *Meliceris*; *Epithelioma Molluscum*; *Acne Varioliformis*—Bazin).—A contagious disease of the skin, characterized by the presence of tumours, generally of small size, but numerous, and presenting peculiar features, to be afterwards described.

The growths usually vary in size from a pin's head to a split pea, but sometimes attain the dimensions of a hazel-nut or even greater. They are almost always multiple, sometimes extremely numerous. They grow slowly, and may either remain discrete or coalesce to form compound tumours. At first they are sessile, rounded, firm, mortar-like, wart-like, waxy or horny. The skin over them is sometimes pinkish, but generally pearly white; afterwards it often becomes yellowish. In the centre of each tumour is a depression or umbilication, giving the characteristic "mother-of-pearl button" appearance, from which the milky-white, opaque, semi-fluid or waxy contents can be extruded by pressure. When several of these coalesce, the composite growth presents several such pit-like depressions, the larger growths generally becoming pedunculated.

The favourite seats for the disease are the face (especially the eyelids), the neck, the mammae (especially in women who are suckling), and the genitalia, but it has been known to occur on any part of the body, except on the palms and soles, and even on mucous surfaces.

The growths may remain quiescent indefinitely, it may be for months; may disappear by spontaneous involution, or may undergo chronic inflammatory induration. Most frequently, however, they suppurate, discharge, and heal; only in the latter circumstance do they give rise to any subjective symptoms beyond disfigurement. They do not necessarily leave scars.

Pathology.—Until quite lately the lesions were universally supposed to be merely enlarged sebaceous glands, a view rendered probable by their never occurring on the palms and soles, but recent researches prove almost conclusively that they arise from the cells of the *rete Malpighii*, and are continuous with that inversion of it which constitutes the outer root-sheath of the hairs. The inter-papillary processes enlarge, the papillae themselves being thereby narrowed and finally becoming mere fibrous bands. The fully developed tumour is surrounded by a firm fibrous capsule, from which septa pass inwards to the centre which corresponds to the umbilication. The lobules then formed are lined by large, columnar, epithelial cells, those of the outer layer having big oval nuclei like those of the normal mucous layer. The centre of the lobule is occupied by a whitish mass, composed of large, ovoid, opaque, or vitreous-looking cells along with egg-shaped nuclear bodies—the "molluscum corpuscles"—the result of a degenerative process. These bodies are, however, not "specific," as they are sometimes found in old comedones and in some epitheliomata, although in less abundance than in molluscum contagiosum. No specific micro-organism has yet been definitely demonstrated, nor has the immediate cause of infectivity been discovered. A recent statement that the molluscum corpuscles are psorospermia, although highly probable, has not been universally accepted, nor has it been confirmed by inoculation experiments.

Differential Diagnosis.—Early cases may be mistaken for ordinary warts or for the simple sebaceous tumours common about the scrotum and penis. Inflamed mollusca have sometimes some resemblance to chancres; confusion with molluscum fibrosum seems hardly possible.

Ætiology.—It is decidedly common in London, but rare in Scotland, and even more so on the Continent and in America. Occurring, as it does, chiefly among the children of the lower classes or in establishments where children are closely aggregated together, little doubt exists in the mind of the profession in this country that the disease is decidedly infectious, and is always communicated by actual contact with an affected person. Its frequent communication from mother to child at the breast, or *vice versa*, is another evidence of its infectiousness, but many dermatologists, especially in Germany, invoke as its sole

cause a special tendency in the cells of the mucous layer of the skin of rapidly growing children towards this peculiar form of degenerative change. Admittedly, inoculation experiments have yielded negative, or at all events ambiguous results.

Treatment.—It must always be borne in mind that the disease tends to undergo spontaneous, albeit slow, recovery. It is usually advisable, however, to expedite cure by touching the smaller mollusca with nitric acid or the acid nitrate of mercury. Pure carbolic acid is also very useful, the growths being afterwards covered with flexible collodion. The larger growths are best incised, their contents squeezed out, and the interior lightly cauterized. J. J. PRINGLE.

MOLLUSCUM FIBROSUM (M. Simplex, M. Pendulum, Fibroma, F. Molluscum) designates a rather rare congenital disease in which tumours, usually multiple, grow from the subcutaneous tissue and lower layers of the true skin. Occasionally the condition is hereditary and present in more than one member of the same family. In a certain proportion of cases it is associated with defective mental development. The growths are usually numerous, sometimes innumerable, their favourite sites being the trunk, head, face, and neck. They are seldom present on the limbs, and, if present, are never numerous. They have been known to occur in the mouth, especially on the cheeks and gums.

They vary in size from that of a small pea to a walnut or even a hen's egg, while many of them, especially in early life, are quite subcutaneous, and their presence can only be ascertained by touch. They increase slowly and progressively with age, and, although their existence at birth is indubitable, they are often not noticed before the age of five or even ten years.

The growths present an infinite variety of character; some, as already mentioned, are subcutaneous, others are sessile with a broad base, others distinctly pedunculated, others pendulous; some are tough and elastic, others soft and flabby; some become mere pouches of loose skin, owing to the atrophy of their contents. The skin over them is generally normal in colour, but occasionally pinkish from excessive vascularity. In exceptional cases there is diffuse pigmentary change over the skin; sometimes, but more rarely, multiple neuro-fibromata have been asso-

ciated with the condition. The tumours are painless, and cause no subjective symptoms beyond a sense of strangeness and disfigurement. They do not inflame or undergo malignant degenerative changes unless irritated, and that only very rarely.

Pathologically speaking, the growths consist of all the constituent elements of the skin and subcutaneous tissue (fibrous tissue, fat, vessels) in very varying proportions. The connective tissue in the centre is always softer and more gelatinous than at the periphery, where its condensation results in the formation of a distinct capsule, so that, if the skin be incised, the little tumour can be shelled out. There is no special connection with the peripheral nerves.

Dermatolysis.—This condition is only an exaggerated form of the preceding, where large flaps or folds of hypertrophied skin are present, their commonest sites being the neck, face, buttocks and chest. Their appearance is often ascribed to an injury or to a fright to the mother during pregnancy. The skin composing these hideous excrescences is often deeply pigmented, thickened, indurated and warty; hypertrophy of the bones or other subjacent tissues is also occasionally present, as in the case of the well-known "Elephant Man." Troublesome dermatitis beginning as intertrigo is apt to arise in these folds of skin, especially if careful cleansing of the parts be not habitually carried out.

Diagnosis.—Fibromata may be mistaken for fatty tumours, fibro-neuromata, multiple sebaceous cysts, molluscum contagiosum, or for keloids, especially their subcutaneous form. Dermatolytic growths must not be confounded with elephantoid conditions.

Treatment.—The small withered growths may be snipped off, the larger ones excised. If the lesions are few in number, small, and subcutaneous, their destruction by electrolysis has been recommended. Ablation of even enormous dermatolyses has been successfully practised. J. J. PRINGLE.

MONOMANIA.—This term has been employed in many senses, and it would be well to abolish its use in scientific nomenclature. It does not indicate a distinct disease, and generally leaves out of sight the fundamental condition. It may possibly be useful to retain the term to express the existence of either a fixed delusion, or a set of delusions of the same general character, but such cases

fall naturally under the head of chronic delusional insanity, which includes both maniacal and melancholic conditions, and to which the reader is referred for a full description.

The fixed delusions just mentioned fall under three chief heads, (1) of imaginary greatness, (2) of secret agencies and persecution, (3) of suspicion. It is generally held that monomania implies the power of reasoning upon topics other than the subject of delusions, but this is a familiar feature in many cases which have nothing else in common with monomania.

GEORGE REVINGTON.

MORPHINOMANIA.—A craving for morphine induced by its habitual use.

The habitual use of morphine, in draught or subcutaneous injection, or in one of the patent medicines containing the drug, is generally found to have commenced (in this country at least) under medical advice, for the relief of pain or sleeplessness, and to have been incautiously allowed to continue. Occasionally it has been resorted to as a solace in mental trouble. In Paris it is said to be frequently employed from the outset as a pure luxury. After some weeks or months or years, during which increasing tolerance of the drug has generally demanded augmented doses, the effects of morphine become very marked. They consist in mental depression, lassitude, restlessness, and a vague sense of discomfort. They are relieved only by renewed administration of the drug, which, as the after-effects grow more and more distressing, gradually becomes an imperious necessity. At first, honest efforts are made to break off the habit; but before long the urgent craving gains an easy victory over an enfeebled brain. The moral tone becomes seriously relaxed, the will is paralysed, and no consideration of truth, honour or duty is allowed to obstruct the overpowering desire to obtain and ingest the coveted poison.

The confirmed morphine-taker becomes pale, sallow, emaciated and prematurely old. His normal condition, when not under the direct influence of morphine, is one of dejection, feebleness and want of interest in life. He is constantly restless, can seldom remain long in one position, and changes his attitudes with sudden jerks or starts. He is liable to fits of tears and to outbursts of violent rage. He suffers from palpitation and tinnitus. His appetite is small

and his digestion painful and imperfect. The bowels are usually loose. He sleeps badly, and is troubled with distressing dreams. Fits of sweating often occur. Untruthfulness and untrustworthiness are painfully obvious, even when the possession of morphine is not concerned. The sexual powers are diminished or absent. The pupils are usually dilated. The pulse is weak and thready.

If the habit be not discontinued, progressive weakness and emaciation end in death from asthenia or from some intercurrent inflammation, as lobular pneumonia. Sometimes the condition merges into genuine insanity.

As to the duration of such a case, it is impossible to frame any general statement. Much depends on the quantities taken.

Treatment.—This consists essentially in the total discontinuance of the drug, but it is seldom that it can be accomplished unless the patient can be subjected to external control. His sufferings on first omitting the accustomed dose are very severe. In addition to restlessness, sleeplessness and mental depression, he experiences a sense of "sinking" at the epigastrium, nausea and, at times, persistent vomiting; and hyperæsthesiæ of various kinds add to his troubles. After a few days the severity of the symptoms usually abates somewhat, and in a few weeks the condition may become tolerable with ordinary resolution.

As a rule, it is best to discontinue the drug at once and wholly, but in some cases a gradual reduction of the dose is found desirable. It is chiefly a matter of mental or moral idiosyncrasy on the part of the patient, and it is impossible to formulate any rule on this point. The closest watching is needed to ensure genuine discontinuance, the cunning of these patients and their capacity for deception being almost incredible.

Drug-treatment may be of some service. Strychnine and caffeine are useful in combating the mental depression and the anorexia. Both must be used in fairly full doses, 5 minims of the liq. strychninæ and 4 or 5 grains of caffeine being given every six hours. The addition of from 5 to 10 minims, or more, of tincture of capsicum and the use of camphor water as a vehicle may tend to relieve the "sinking." Vomiting is best checked by stimulating applications (mustard plasters, turpentine stupes, &c.) to the epigastrium. A warm bath will sometimes benefit the restlessness.

It may be necessary to procure sleep at night by some drug other than morphine, and for this purpose one should be selected which is not likely to establish another "habit" in place of the morphine taking. From 15 to 20 grains of sulphonal cautiously increased may (*at present*) be employed; but most benefit is obtained from hyoscyamus, alone or in combination with cannabis indica. These drugs may be given in the form of pills made of their extracts, or as a mixture into which their tinctures enter. The hyoscyamus should be prescribed in full doses—8 grains of the extract or a drachm of the tincture; the Indian hemp, which is an uncertain drug, in guarded doses at first $\frac{1}{2}$ grain of the extract or 15 minims of the tincture. Bromides are not often of real service, and alcohol is best avoided altogether. Digitalis may be required if the heart's action be feeble. A brisk dose of calomel is advisable at the outset, even when diarrhoea is present. Should the bowels continue loose, chalk or astringents must be resorted to, with warm applications to the abdomen. Food must be pressed as the capacity for taking it returns.

ISAMBARD OWEN.

MUMPS (Idiopathic Parotitis).—An acute infectious disease characterized by swelling of the parotid and salivary glands, running a definite course, and terminating in recovery.

Symptoms.—The period of invasion is short, usually less than twenty-four hours, and is marked by some discomfort in the region of the parotid gland, especially on moving the jaw, also by a rise of temperature, lassitude, headache, and anorexia.

Sometimes there are no premonitory symptoms, and at others the disease is heralded in an alarming manner by vomiting, diarrhoea, and convulsions.

The first symptom is a stitch-like and increasing pain in the region of one parotid (generally the left) spreading to the jaw, and aggravated by any movement as in talking, &c. Soon a swelling appears, at first in the hollow between the mastoid process and the jaw, but rapidly spreading on to the face in the masseter region; the swelling is wedge-shaped, the apex being downwards. Then the neighbouring tissues, if not from the first involved, become infiltrated, causing a rapid extension of the swelling in the neck, both downwards and towards the spine, to which in severe cases it may reach. The overlying skin is tense and

shiny, it is occasionally reddened, and sometimes pits on pressure. The swelling continues to increase for about three days, it remains stationary for about two days, and then rapidly subsides, completely disappearing in the course of about five days. The submaxillary gland and the tissues in its immediate neighbourhood may be affected in an exactly similar manner.

In rare instances the disease is confined to one side, but much more frequently the other parotid becomes affected within two days, and in very rare instances both sides are attacked at once. So long as one side only is involved the head is inclined to that side, afterwards it is held stiffly erect. The movements of the face are in abeyance, owing to the pain in the jaws, and it is consequently expressionless, whilst the swelling in the parotid and submaxillary regions gives the patient a grotesque and most unnatural aspect. The mouth is either closed or permits of such very slight opening that the patient is reduced to liquid food, and even this causes much pain. Other symptoms usually present are thirst, anorexia, and constipation. The temperature seldom rises above 104° F. The pulse is frequent and the tongue furred. The saliva is not, as a rule, altered either in quantity or character, but owing to the difficulty in swallowing, it accumulates in the mouth and dribbles away, giving rise to the mistaken belief that the secretion is excessive. The general symptoms abate in severity as the swelling subsides.

The most common complication is the so-called metastasis, to the testes in the male, or to the ovaries (?) or mammae in the female. This is most common in those who are attacked about the period of puberty, and is more often observed in males than females. Some six or eight days after the commencement of the illness swelling of the body of one testis appears, and fluid collects in the tunica vaginalis. In the course of a day or so the other testicle is similarly affected, but it is rare for both to be simultaneously attacked. The swelling is accompanied by great pain and tenderness, and some oedema of the scrotum is often present. The course of this affection is precisely similar to that of the parotid, and there is a separate recurrence of fever and febrile symptoms. Atrophy of the testicle has been known to follow, but such an event is rare.

Rheumatic symptoms with heart lesions have been observed, and in very

rare cases meningitis has supervened, as also disease of the spinal cord. Deafness is a complication to be feared, though when it is due to an extension of the inflammatory process from the pharynx (for in a few cases the pharynx and tonsils are affected), along the Eustachian tube it usually passes off in a few days; but when it begins suddenly without any such cause, it is generally permanent; in a few cases it has been due to suppuration taking place in the parotid. and the subsequent bursting of the abscess into the auditory passages. Facial paralysis has been occasionally observed.

As a rule recovery is complete, though a good deal of general debility may be left, and in scrofulous children enlargement of the lymphatic glands is often set up.

The *diagnosis* can only be doubtful when the second side is not yet affected, and the swelling does not obviously extend on to the jaw.

Pathology.—The first change is hyperæmia of the gland with an exudation of serous fluid, the parotid is swollen, reddened, and on section is of a uniform fleshy aspect. There is a good deal of serous infiltration of the surrounding tissues, and it is believed that sometimes the gland itself may be unaffected. It is probably not the result of the extension of a specified catarrh along the duct of the parotid, otherwise in affections of the mouth inflammation of the parotid would be more common.

Ætiology.—The disease is hardly known in infants, and is decidedly rare in early childhood, being most common between the ages of five and fifteen, but it is seen in adults, though not in old people. A second attack is almost unknown. It is more common in males than in females, and is said to be most prevalent in the spring. Epidemics are apt to occur either directly before, or during, or directly after, outbreaks of measles, and to a less extent of scarlet fever and diphtheria. The children of the poor do not seem to be so susceptible to it as those of the well-to-do. The period of incubation is from two to three weeks or even longer, during which time there are no symptoms. The disease is probably most contagious at first, but it is believed that a person is not free from infection for a month from the onset. Of the nature of the contagium nothing is known; it is supposed to be conveyed by the breath.

Treatment.—In many cases it will not be necessary to do more than keep the

patient in a warm even temperature, on such light diet as can be swallowed, with an occasional saline purgative. When the swelling is great, warm fomentations with or without opium, water dressings or light poultices may be used. Iced drinks and drop doses of tincture of aconite every hour are useful. Sleeplessness may be overcome by bromide of potassium. The orchitis should be treated by supporting the testicles and applying warm anodyne lotions. During convalescence tonics and cod-liver oil may be given with great benefit.

JOHN ABERCROMBIE.

MUSHROOMS, Poisoning by.—Various species of these fungi possess poisonous properties, but the one which in this country most commonly gives rise to urgent symptoms is the *amanita muscaria* or fly-fungus, the active principle of which is *muscarine*.

Symptoms.—The effect of the poison is exerted chiefly upon the gastro-intestinal and nervous systems. Colic, nausea, vomiting and diarrhœa follow a few hours after the ingestion of the poisonous fungi. Excitement and delirium, ending in a condition of stupor and coma, are the prominent nerve symptoms.

In severe cases the symptoms somewhat resemble the algide stage of cholera, collapse, cyanosis and muscular contractions preceding a fatal termination.

Morbid Anatomy.—The chief signs are those of a very acute gastro-enteric catarrh. Portions of the fungi may be found adherent to the mucous membrane of the stomach and intestine.

Prognosis.—Severe diarrhœa, with rice-watery stools and violent delirium, are very unfavourable symptoms.

Treatment.—The stomach should be washed out immediately with a syphon tube, or an emetic of sulphate of zinc (gr. xx in water), or mustard (ʒss in water) may be administered. Atropine, the physiological antagonist of muscarine, should be given at once, either in the form of the tincture of belladonna (℥xx in water), or 2 drops of an injectio atropinæ hypodermica (gr. $\frac{1}{10}$), to be repeated in half an hour if necessary. The best purgative is castor-oil, of which an ounce should be given as soon as possible.

If there be much depression stimulants will be needed, brandy, ether and ammonia being the most suitable. The patient should be kept warm, and should

remain in bed for some days after the urgent symptoms have disappeared, owing to the liability to cardiac paralysis.

MYELITIS, ACUTE.—A term applied to any inflammatory affection of the spinal cord of rapid onset.

Such a condition may be primary or secondary. The symptoms vary according to the amount of the cord affected and the position of the lesion.

Symptoms.—In primary or idiopathic acute transverse myelitis there is rapid paraplegia, motion and sensation becoming profoundly affected in a few hours, or sometimes in a few days. The initial spinal symptoms are often accompanied, and sometimes preceded for a short period, by fever and general malaise. Pain in the back and limbs, unlike what occurs in spinal meningitis, is frequently absent, and if present, slight and transitory. Spasms and twitchings of the muscles, moreover, are of comparative rarity in the early stage of myelitis.

Numbness, tingling and such-like sensory disorders commonly attack the limbs, and then ensue, after a varying interval, loss of motor power and sensibility in the extremities.

The paralytic symptoms in acute myelitis do not supervene so suddenly as in spinal hæmorrhage. In the former the onset may extend over a period varying from a few hours to several days, whereas in the latter the onset is quite sudden.

In exceptional cases the commencement of acute myelitis is comparatively abrupt, and it occasionally happens during the course of the disease and when the symptoms have attained a high degree of intensity that a sudden exacerbation takes place. In such cases it is highly probable that spinal hæmorrhage has occurred secondarily. When the symptoms of acute myelitis have reached their height, there is, more or less, complete paralysis with anæsthesia of the affected limbs.

Control over the sphincters is usually lost from the first. The urine frequently becomes ammoniacal at an early period, and cystitis is common. Bed sores over the sacrum and other parts subjected to pressure often occur with great rapidity and in spite of all precautions. The temperature of the paralyzed muscles is usually slightly raised in the early stage, but subsequently it falls a degree or two below the normal.

Since the lower part of the spinal cord is the most frequent seat of myelitis, it

follows that the lower limbs only are affected in the majority of cases.

If the cervical region be involved, the arms suffer as well as the legs, and, if the disease be above the origin of the phrenic, paralysis of the diaphragm will occur.

When the disease is above the lumbar enlargement, the muscles of the lower limbs are at first flabby, but later on they recover tone, and still later they may become the seat of spasm from descending degeneration of the pyramidal tracts.

When the lumbar and sacral regions are involved, the muscles of the legs remain flabby, waste, and exhibit the reaction of degeneration.

Sensation is sometimes lessened, sometimes absolutely lost. Just above the upper limit of the anæsthesia there is frequently a zone of hyperæsthesia, or a feeling of constriction—the so-called “girdle pain.” A hot sponge passed down the spine will usually detect the hyperæsthetic point by the feeling of pain caused. The hyperæsthetic line is often situated about the level of the epigastrium, but, whatever its position, it indicates the upper limit of the lesion in the cord.

The condition of the reflexes depends on the vertical extent of the spinal lesion. When the mischief is in the dorsal region, the reflexes of the lower limbs may be temporarily abolished by shock. Later on, reflex action returns, and exaggeration occurs if descending changes take place. When the lumbar and sacral regions are implicated, the superficial and deep reflexes are permanently annihilated. The condition of the cremasteric, abdominal and the various trunk cutaneous reflexes give valuable aid in determining the vertical extent and the upper limit of the spinal lesion.

The pupils are occasionally affected when the cervical region is involved. In a few instances optic neuritis has been described, and in most of such cases the myelitis has been of the disseminated form.

The *course* of acute myelitis is variable. In the severe cases death frequently ensues from respiratory disorders, or from pyæmia following on bed sores, or from the extension upwards of inflammation from the bladder to the kidneys. In other cases sensation returns almost in its entirety, the motor power being regained later on, though often imperfectly.

Muscular spasm, as has already been

pointed out, may occur when the mischief is above the lumbar enlargement. Under such circumstances a state of spastic paraplegia may slowly supervene, the lower limbs being sometimes in extension, sometimes in flexion. The latter condition unfortunately renders the upright posture and walking impossible, and hence the patient is permanently bedridden.

Sometimes very great improvement, occasionally amounting to a practical recovery, takes place in acute myelitis, and it is well to bear in mind that a favourable change may occur, even when paralysis has been present to a marked degree for many months.

Myelitis of traumatic origin, that due to slow compression by growth, caries or other agents, and that which results secondarily in spinal meningitis do not call for special notice here (*see SPINAL CORD, SLOW COMPRESSION OF*).

Varieties.—The foregoing description does not apply to all cases of acute inflammation of the spinal cord. In some instances the disease may consist of a single limited patch of inflammation (*focal myelitis*) or the foci may be multiple and scattered (*disseminated myelitis*). Under such conditions the symptoms may be of limited extent, or, on the other hand, irregular in distribution. Many cases of infantile paralysis are, doubtless, instances of focal myelitis involving the anterior grey matter (acute anterior polio-myelitis).

Diagnosis.—The points which serve to distinguish most cases of myelitis from spinal hæmorrhage have already received attention. Granted the diagnosis of acute myelitis, it is then necessary to decide whether it is primary or secondary. Caries and malignant growths of the vertebræ will sooner or later make themselves manifest by their characteristic signs, although not uncommonly all indications of their existence are absent at the onset of the spinal mischief.

Pain of any severity and persistency suggests myelitis by compression, meningitis or meningeal hæmorrhage (*see SPINAL CORD, HÆMORRHAGE INTO*).

Acute ascending paralysis (Landry's paralysis) resembles closely an acute ascending myelitis. In the former, however, sensation is unimpaired and the muscles preserve their electrical excitability.

Prognosis.—A guarded opinion should always be given in the early stage, inasmuch as extension of the lesion upwards

may take place. When this occurs, danger to life from paralysis of the intercostal muscles or of the diaphragm is possible. The acute formation of bed sores, or the rapid onset of cystitis, which occur mainly when the diseases affect the lumbar and sacral regions, are grave indications, though not necessarily leading to a fatal result.

When the lesion is limited to the dorsal part of the cord, the patient often becomes the subject of spastic paraplegia, and if the lower limbs be in extension, the power of walking may be regained. An early return of sensation is a favourable symptom, fair motor power often subsequently being acquired in such cases.

Morbid Anatomy.—In the acute stage, the pia mater is injected and the affected part of the cord swollen and softened. On section, the distinction between grey and white matter is lost or ill-defined, and the tissue is often diffuent and of a red or reddish-brown colour. This is sometimes termed the stage of "red softening," and when the extravasation of blood is considerable the affection has received the name of "hæmorrhagic myelitis." The changes which the effused blood undergoes, and the fatty degeneration which attacks the damaged nerve-elements, lead, in course of time, to alterations in colour of the affected part of the cord (yellow and white softening). Still later, the cord assumes a greyish tint, becomes atrophied, and finally cicatrices may form and occasionally cavities. In chronic cases, moreover, sclerosis of the various spinal tracts supervenes.

On microscopical examination the capillaries and small arteries and veins are distended with blood. The walls of the vessels are thickened by cells, and the peri-vascular sheaths filled with leucocytes. In the grey matter the ganglion cells are first swollen, granular, and cloudy, the nucleus and nucleolus being in process of division or sometimes vacuolated. The cell-processes, at first swollen and irregular, finally shrivel and disappear. In the terminal stage the cells are represented by small, irregular, structureless masses, or may disappear altogether.

In the white matter the nerve-fibres become irregular, the medullary sheath showing granular and fatty degeneration. The axis-cylinders are commonly granular and enlarged, exhibiting in their course irregular swellings. The fibres frequently undergo atrophy, the axis

cylinders however persisting for a long period.

In transverse sections of the cord clear spaces may often be seen, formed by the removal of degenerated nerve-fibres. The neuroglia becomes swollen and amorphous in aspect, except for scattered nuclei. The cells of Deiters and their processes undergo marked enlargement. After the lapse of time the affected area may become fibrous, but numerous nuclei and the cells of Deiters, together with dilated and thickened vessels, are visible for a considerable time. The spinal nerve-roots and the peripheral nerves show degenerative changes.

Ætiology.—Males are more frequently affected than females, and the disease is most common between the ages of ten and forty. Prolonged exposure to wet and cold, especially to both combined, and over-exertion, are frequent exciting causes. Myelitis is often dependent on injury to the cord, such as concussion or fracture-dislocation of the vertebrae. The disease sometimes follows variola, measles, typhus and other acute specific fevers. Syphilis and alcohol have a possible share in the production of myelitis. Compression of the cord by growths involving either the membranes or substance of the cord, spinal caries, malignant affections of the vertebrae and spinal meningitis not unfrequently give rise to secondary inflammation of the spinal cord. Lastly, it may be mentioned that in many cases of acute myelitis no cause can be determined. It has been suggested that occasionally an infective agency may be at work, and this idea is borne out by the appearance of thrombi and micrococci in the small vessels, described by some observers.

Treatment.—In the early stage absolute rest should be enforced, the prone position being strongly advised by some authorities. Dry or wet cupping, the choice to be determined by the general condition of the patient, and stimulating applications to the spine, may be employed. Strong counter-irritants, such as blisters and the actual cautery, should be employed with extreme caution. The danger of the formation of obstinate sores from such remedies must be remembered. Chapman's ice-bag to the spine is sometimes of service. It is of the utmost importance to guard against the formation of bed sores, and with this object in view the most scrupulous cleanliness should be enforced. Parts exposed to pressure should be sponged with spirit and then carefully dried and dusted.

The effects of pressure may be considerably obviated by the use of cotton wool. When there is incontinence of urine the tendency to bed sores is increased. Absorbent cotton wool, frequently renewed, may be used. If there be retention the regular use of the catheter is required. The instrument should be absolutely clean, and just before use should be cleansed with carbolic solution and then lubricated with carbolic oil. If cystitis occur the bladder must be washed out with an antiseptic solution.

Bed sores demand constant attention, and the slightest appearance of redness must be anxiously watched. The application of fine oakum over the dressing is often of great use in obviating the factor of bed sores.

The influence of drugs in myelitis is doubtful. Ergot and belladonna are recommended in the early stages. Mercury and iodide of potassium seem to be of little avail, even in cases in which there is a probable syphilitic origin. In the later stages of myelitis, preparations of iron, quinine, arsenic and strychnia may be employed. Rubbing and the use of electricity are of service when the acute period is over. W. B. HADDEN.

MYXŒDEMA (Adult Sporadic Cretinism, Cachexia Pachydermique of Charcot). *History.*—This disease was first described by Sir William Gull in 1873, in a paper entitled "On a Cretinoid State supervening in Adult Life in Women" (*Clin. Soc. Trans.* vol. vii.) The name "Myxœdema" (mucus, œdema) was suggested by Dr. Ord, on the ground that a mucin-yielding œdema was the chief observable condition (*Med. Chir. Trans.* vol. lxi.). In 1883, Kocher of Berne called attention to a series of symptoms which he had observed to follow total extirpation of the goitrous thyroid gland in man. This morbid state, to which he applied the term "cachexia strumipriva" was shortly afterwards discussed by J. L. Reverdin, who then directed attention to the resemblance between this condition and myxœdema. These communications were brought before the Clinical Society in 1883, by Dr. Felix Semon. A committee of investigation was subsequently nominated by the Society and a report on the subject of myxœdema and its associated conditions was issued in 1888 (*Clin. Soc. Trans.* "Report on Myxœdema," supplement to vol. xxi.). The description of the disease here given is based on this report.

Definition.—Clinically, myxœdema is characterized by a peculiar physiognomy, by an increase in the bulk of the body, by nutritive changes in the skin and elsewhere, and by slowness and imperfection of both bodily and mental processes. The only constant pathological condition is destructive change of the thyroid body.

Symptoms.—The physiognomy is characteristic and has been variously described as cretinoid, mask-like, placid, heavy. The features are broad, puffy and coarse, the nostrils swollen, the lower lip thickened, everted and livid, the mouth widened transversely. Over the cheeks and nostrils there is a well-defined red patch, contrasting in a marked degree with a pale, wax-like orbital area. The body is bulky and unwieldy, and the skin everywhere dry, scaly and thickened. Moles and warty growths are very frequent. There is almost invariably an absence of perspiration and of sebaceous secretion. Localized tumefactions, dependent probably on the accumulation of fat, are often present, the usual site being the supraclavicular regions. The hands are broad, swollen, and clumsy-looking, and the nails not uncommonly stunted and brittle. The feet are affected like the hands. The hair of the scalp is dry, ragged and broken. Sometimes there is marked baldness. The eyebrows, eyelashes, and the hair on the pubes and in the armpits suffer in the same manner. The teeth often become brittle or undergo caries, the gums being spongy and swollen. The tongue is usually enlarged, and the uvula and soft palate swollen. The thyroid gland, as shown after death, is almost always diminished in size; sometimes this can be ascertained during life, though very often this point cannot be satisfactorily determined in consequence of the fulness of the neck, so common in myxœdema. Changes in the character of the speech are well-nigh constant, the utterance being slow, monotonous, thick and guttural, as though the tongue were too large for the mouth. In almost all cases there is marked intellectual torpor, the patient being sluggish, placid and indifferent. A tendency to undue persistence in thought and action has been described by Dr. Ord. Occasional attacks of irritability or fretfulness may occur; and in nearly one-half the cases absolute insanity has been noted, chiefly in the advanced stages of the disease. Memory is usually impaired from an early period, especially

for recent events. Somnolence during the day is frequent, and sleep at night is often disturbed by unpleasant dreams. The only disorder of sensation which occurs with any marked frequency is retardation. With respect to this point, it must be remembered that these patients are dull of perception, and hence this form of sensory disorder must probably be looked upon as part of the general intellectual hebetude. The special senses often suffer. Deafness to a varying degree occurs in about one-half the cases. As regards sight, the most common defect is general diminution of acuteness of vision. Excessive watering of the eyes has been sometimes observed. Exophthalmos has occurred in the early stages in a few instances, and as an equally rare condition cataract may be mentioned. Subjective sensations, referable to both common and special sensation, are common. Among the less frequent symptoms may be noted, occipital headache, convulsions, and agoraphobia. The bodily movements are performed slowly, though usually without imperfection. Falls leading to injuries such as fracture of the patella, sometimes occur, and there is not unfrequently some degree of inco-ordination. The ordinary duties of life, such as dressing, are not only performed with great deliberation, but entail an amount of lassitude quite out of proportion to the muscular effort put forth. The muscles of the neck are often enfeebled, so that the head falls forward, the chin resting on the sternum, as in cretins. The gait is slow, ponderous, and elephantine. The reflexes, superficial and deep, are usually normal; sometimes they are diminished or delayed, in exceptional instances absent. Occasionally they have been described as brisk or exaggerated. Sensations of cold are practically constant, and this is not merely subjective. The temperature, especially when the average is taken over a long period, is almost invariably sub-normal. A temperature four or five degrees below the normal standard, persisting for weeks, is frequent. As regards the urine, it may be noted that the specific gravity is often sub-normal, that albuminuria in the later stages may be present as an accidental condition, and that the amount of urea is probably always diminished, sometimes the excretion falling to a half or even less of the average quantity. Glycosuria occurs as a rare condition. No characteristic changes are present in the blood, though rarely there is diminution

in the red corpuscles or the hæmoglobin. The heart is usually normal; accentuation and reduplication of the sounds have been occasionally noted. The pulse is weak, soft, and slow; in only exceptional cases is excessive tension present. Respiratory troubles sometimes occur, in some instances being the immediate cause of death. The appetite is generally much impaired. As a rule the bowels are constipated, but occasional watery purging is not uncommon. True dropsy sometimes supervenes, though usually it is slight and limited to the feet and ankles; in rare cases ascites to a marked degree has occurred. The onset of œdema or effusion has been observed to coincide with an amelioration in the general condition. Irregularities of menstruation are frequent, sometimes the flow being scanty, sometimes profuse. An early disappearance of the catamenia has been recorded in some cases. Uterine hæmorrhage, either subsequent to parturition, or more often occurring independently, is not uncommon. It may be observed here that myxœdema is no bar to pregnancy. Even in the advanced stages gestation may take place and go on to the full period. Hæmorrhages from the nose, gums, teeth and bowels, as well as from the uterus, have been frequently recorded.

Death usually results from intercurrent maladies, such as bronchitis, phthisis or pneumonia. In a certain number it is the direct result of the disease, mental disorder supervening, with subsequent coma.

Diagnosis.—The facies is so characteristic, that, once seen, no difficulty in diagnosis will henceforth present itself when the disease is in the fully developed stage. The peculiar physiognomy of myxœdema was in the past mistaken for that of chronic renal disease, and even now the two conditions are occasionally confounded. The points of divergence are so numerous and striking that it would be superfluous to enumerate them. In the initial period of the disease it is a matter of considerable difficulty to pronounce a positive diagnosis. Indeed, in the writer's experience, it is often impossible to do so. It may be mentioned, however, that fugitive œdema, especially when affecting the face, ought to excite the suspicion of early myxœdema. In a doubtful case it is only by a comprehensive survey of all the symptoms that an opinion of any kind can be formed.

Occasionally the embarrassment of speech is so obtrusive that the possibility

of bulbar paralysis has been entertained. An instance of this recently occurred in the experience of the writer. The affection known as "Acromegaly" (*q.v.*), has many important features in common with myxœdema. It will be sufficient, however, to mention that in the former there is great enlargement of the hands and feet, without any increase in the general bulk of the body, that the skin presents none of the alterations seen in myxœdema, that the hair is normal, and that bodily and mental torpor are not present, except perhaps in the terminal stage. In acromegaly the cartilages of the nose, eyelids and ears become hypertrophied, but the characteristic cretin-like aspect is wanting. Lastly, certain of the bones become enlarged in acromegaly, and this is especially striking in the lower jaw. Other points of difference will be obvious on referring to the article on acromegaly.

Prognosis.—The disease is chronic, and the tendency is usually from bad to worse. Periods of temporary improvement occur, sometimes unconnected with treatment; in a few instances marked amelioration has taken place during or after pregnancy. There is little doubt that judicious treatment is of the greatest service. The duration of life is doubtful, but it is certain that existence may be prolonged for twenty years or more after the disease has attained its fully developed state.

Morbid Anatomy and Pathology.—The disease is essentially an affection of the thyroid gland, which to the naked eye after death is small, pale or yellowish white, firm and fibrous-looking. Microscopical examination shows in the early stage a small-celled infiltration of the walls of the vesicles with epithelial proliferation in the vesicles themselves. Later the gland becomes converted into delicate fibrous tissue, in which are seen clumps of small round cells, clearly the remnants of vesicles. Finally, the gland structure is replaced by fibrous tissue, in which small islets of round cells are sparsely placed. Death occasionally ensues before the anatomical change reaches the advanced stage, and sometimes before the entire gland becomes invaded. Alterations in other organs and tissues occur, but they appear to have no causal relation with the disease. In the skin there is very frequently nuclear hyperplasia and the development of connective tissue, mainly in the neighbourhood of the sudoriparous and sebaceous glands and around the hair follicles, anatomical changes which explain

some of the conditions already described in the clinical account. Occasionally there is to be seen an unusual interval between the bundles of fibrous tissue in the corium, and this open-textured appearance has been found in the lower eyelid. In the Clinical Society's Report no opinion is offered by the sub-committee as to the significance of this condition. Dr. Ord, however, is of opinion that the spaces described probably contained mucin. Interstitial change does not occur in the organs as a generalized condition, though occasionally it is present to a varying extent in the sympathetic, kidneys, liver, heart, and submaxillary gland. As regards macroscopic appearances, it may be mentioned that the subcutaneous fat, as well as the fat elsewhere, is abundant, that at the time of death anasarca and serous effusions are frequent, that the kidneys often exhibit more or less interstitial change, that the left ventricle of the heart is hypertrophied in those cases in which the kidneys are markedly affected, and that some degree of degeneration of the larger arteries is common. In exceptional cases tubercular disease of organs and cirrhosis of the liver have been found.

Pathology.—It is well-nigh certain that myxœdema is identical in essential points with cretinism, both endemic and sporadic, as well as with cachexia strumipriva. All these conditions are dependent on loss of function of the thyroid body, whether that loss be due to destructive change occurring sporadically in adult life from causes yet unknown, to congenital absence, or to early developmental arrest, or to total extirpation of the gland by the surgeon. Certain clinical differences exist between myxœdema and cretinism, but such points of divergence are related to the period of life at which the disease begins. The arrest of growth and general development found in cretins does not occur in adult sporadic cretinism or myxœdema because in the latter the disease supervenes at a time when the organism has already attained full development; in short, it is a question of decay, not of arrest. Mr. Horsley's experiments on animals, particularly on monkeys, have shown that symptoms of cretinism follow complete removal of the thyroid gland. Furthermore, it has often happened that extirpation of the goitrous thyroid gland in man has given rise to symptoms identical with those of myxœdema. It may be mentioned here

that in some instances no indications of cretinism have followed supposed complete removal in man, and that in others the symptoms of cachexia strumipriva have occurred after partial removal. The immunity in the first case is probably due to the presence of accessory thyroid glands and their subsequent compensatory hypertrophy, or to the fact that the removal has really been incomplete, or, lastly, to insufficiently long observation after the operation. As regards the second apparent fallacy, it is probable that the part of the gland left behind was functionally inactive in consequence of structural change. (For full information on this point see "Report on Myxœdema," section vi, by Dr. Semon.) The origin of the term "myxœdema" has already been explained. The careful analyses of Dr. Halliburton show that the increase of mucin described in Dr. Ord's first case has not been found in anything like the amount in subsequent cases. Various causes no doubt would account for this fact, but it is sufficient here to say that an increase in mucin is not constant at all stages of the disease. The term myxœdema has now passed into common parlance; nevertheless it is imperative to bear in mind the intimate relations which this disease has to cretinism and cachexia strumipriva.

The cause of the destructive change in the thyroid gland in myxœdema is quite unknown. The exact physiological function of the gland, moreover, has not yet been determined. That it regulates nutrition in some manner is undoubted. It would appear that in myxœdema the normal destruction of the tissues and their consequent removal, which is essential for the maintenance of health, is much diminished. The lowered temperature and the diminished excretion of urea point to this, and it is instructive to note in this respect that many of the most salient features, such as the bodily and mental torpor, may be explained on the assumption that the normal metabolic processes are partially arrested.

Ætiology.—It is curious that those districts in Great Britain in which goitre is endemic, and others in which cretinism is known to occur, do not supply cases of myxœdema in a disproportionate amount. It should be mentioned, however, that Dr. Morvan has reported eleven cases of myxœdema occurring in Lower Brittany. Professor Kocher, of Berne, has informed the writer that he has neither seen nor heard of any instance of ordinary myxœdema, or adult sporadic cretinism in

Switzerland. Nothing of a decisive character has been ascertained with respect to causation. The disease is much commoner in women than in men, the proportion being as six to one. The onset may occur at any period between early adolescence and extreme old age, but the majority of cases arise between thirty and sixty-five. Syphilis, alcoholic excess, and social condition have no influence. The disease has, in a few instances, attacked members of the same family, and rarely it has been transmitted to the offspring. Among possible predisposing causes may be mentioned tubercle, neuroses of various kinds, mental disturbance, acute rheumatism, prolonged lactation, pregnancy, catamenial irregularities, and hæmorrhages.

Treatment.—In many instances periods of marked improvement have been noted, and in one case an actual recovery is alleged to have taken place. The natural

conditions under which these favourable remissions occur are but little understood. The influence of warmth is particularly striking. The bodily heat should be promoted by suitable clothing, by friction of the body, and by massage. Turkish or hot air baths may be employed. If possible, the patient should be removed during the winter to a warm climate. Of all drugs jaborandi is the most useful; it may be given in doses of 30 minims of the tincture, increased gradually to a drachm, three times in the day. Pilocarpine has a similar beneficial action, and may be used subcutaneously. Nitro-glycerine, which has been employed in a limited number of cases with good result, deserves a more extended trial. Iron, quinine, strychnine, nux vomica, arsenic, iodide of potassium, mercury, cod-liver oil, and many other remedies have been employed, the majority with doubtful effect.

W. B. HADDEN.

N

NASAL POLYPI.—Tumours, usually of a soft, jelly-like character, growing in the nasal passages.

Symptoms.—These may be divided into local and general. A sense of fulness and stuffiness in the nostrils, with difficulty in breathing through the nose, in some cases passing on to complete obstruction, a constant secretion from the nostrils, partial or complete loss of the sense of smell, and frequently more or less deafness, are the chief local symptoms. Among the general or remote symptoms must first of all be enumerated asthma, which, as Voltolini was the first to point out, may owe its origin to the existence of nasal polypi. Even when not directly due to polypi, asthma is always aggravated by their presence. Cough, hay-fever, epilepsy, giddiness, nightmare, &c., have been met with in patients suffering from polypi, and have disappeared after the removal of these growths.

Polypi may frequently be recognized without instrumental aid, as they sometimes even protrude from the nostrils. The most convenient method of examining the nostril is by means of Duplay's bivalve speculum. Polypi almost invariably take their origin from the middle or superior turbinated bodies, or from the outer wall in the middle meatus, occasionally from the inferior turbinated

body, but hardly ever from the septum. They are usually of a pinkish or pearly-grey colour, round or pear-shaped, unless distorted by pressure, and of a gelatinous consistence. They are almost always multiple and frequently occur on both sides.

Diagnosis.—Hypertrophy of the inferior turbinated body is sometimes mistaken for a polypus; the situation, firm consistence and red colour should suffice to prevent the mistake. Erectile swelling of the anterior end of this body may also be confounded with a polypus. The effect of cocaine in causing a disappearance of this swelling will suffice for the diagnosis. A deviated septum might also give occasion to error. Malignant growths in the nose are generally more firmly attached than polypi, are harder, more painful, and bleed freely.

Prognosis.—Polypi, though not dangerous to life, are exceedingly troublesome to eradicate. In a case now under the care of the writer the history shows the condition to have been present for thirty years. The mucous membrane is now of a myxomatous character throughout, so that it is only possible to prevent the formation of fresh polypi by using the galvano-caustic loop every four or five months.

Morbid Anatomy.—Mucous polypi belong to the myxomata, consisting of a

loose form of connective tissue, the meshes of which are filled with stellate cells and with a mucin-yielding substance.

The papillomata are another form of nasal polypi; these almost invariably spring from the inferior turbinated body.

Nasal polypi generally occur at the middle period of life, and are very rarely met with before the age of sixteen. The writer has met with a case in a girl of fifteen. Mackenzie's youngest case was sixteen years old.

Treatment.—The rough-and-ready mode of removal of polypi by forcible avulsion by means of forceps is now becoming a thing of the past, and the question at present is as to the employment of the galvano-caustic loop as opposed to the loop of cold wire. To a large extent this is determined by individual custom; the cold snare requires less apparatus, but then the tug requisite to remove the polyp is a somewhat painful procedure. The writer has from the first employed the galvano-caustic loop, and he has been so satisfied with it that he has not been tempted to try other methods. The application of a 20-per-cent. solution of cocaine by spray or brush much facilitates the operation, by causing contraction of the mucous membrane and by rendering it anæsthetic. But when the polypi have been removed, whatever process be employed, there still remains the difficult task of preventing their recurrence. The most convenient plan is to burn down the pedicle by means of the galvano-cautery, cocaine having been previously employed to render the part anæsthetic, or caustics such as chromic acid in the form of crystals, or the 90-per-cent. solution of carbolic acid, may be applied to the base of the polyp, but in the case of multiple sessile growths the tendency to recurrence is so great that the utmost patience and perseverance are required in order to attain the desired end.

F. DE HAVILLAND HALL.

NEURALGIA.—Much difference of opinion has existed in regard to the limitation of the term neuralgia. Derivatively meaning nerve-pain, it has been applied to all disorders in which pain referred to the peripheral nerves has been a prominent symptom. Thus it used to include migraine, which, indeed, in many of its characters bears a strong likeness to neuralgia, but differs so much in others that it is now generally regarded as a substantive affection. Scia-

tica is still regarded by some as essentially neuralgic in character, but for reasons stated in the article upon that subject it is probable that most instances of that disease are really due to a perineuritis, and should be so considered. The application of the term neuralgia would in this way be restricted to cases of functional nerve-pain, which, however, may originate in irritation of the sensory nerve terminations. Such a definition would exclude all cases of peripheral neuritis, whether idiopathic or depending upon injury to the nerve by wounds, or the presence of a tumour, &c., but, on the other hand, would include those instances in which nerve pain is reflected to a nerve-tract from peripheral irritation.

Symptoms.—The onset may be sudden, but more generally the patient becomes aware of certain anomalous sensations in the course of some nerve—e.g., tingling, numbness, and pins and needles, the meaning of which he soon learns to appreciate. Actual pain is soon experienced, and this is paroxysmal and spontaneous or excited by movement, so that the mere act of eating may cause the greatest discomfort. It is variously described as lightning-like, stabbing, boring, darting, or burning, and is generally confined to the distribution of one nerve, but in severe cases radiates into other surrounding nerve regions.

The pain is nearly always unilateral, and even when symmetrical it is usually much more intense on one side than on the other. Symmetry has been supposed to be the characteristic of diabetic neuralgia, but it is certainly present in other cases. In some subjects the pain is invariably referred to one nerve, which seems particularly vulnerable, but in others it is migratory, attacking first one nerve-tract and then another. The skin in the affected region is often hyperæsthetic, so that very slight influences excite pain or exaggerate the neuralgic paroxysms. Tender points, the *points douloureux* of Valleix, are in about half the number of cases to be found in the course of the nerve. They are very circumscribed, and correspond, as a rule, to the place where the nerve pierces a fascia to become superficial or emerges from a bony canal. Certain definite tender points are therefore to be found in the course of most superficial nerves, and will be noticed hereafter when the general distribution of neuralgia is considered. Trousseau has described a tenderness over the spinous process corre-

sponding to the origin of the painful nerve, but it is not constant and may occur under other conditions.

Vaso-motor disturbances are common, and usually lead at first to constriction of vessels, causing pallor, and subsequently to their dilatation and blushing, which may be accompanied with an increased secretion of sweat. If long continued, the congestion of the tissues leads to tumefaction and hypertrophy, changes which are sometimes associated with an erythematous condition simulating erysipelas.

When the pain is very severe, reflex spasm may be induced in the related muscles, and is especially liable to occur in those of the upper lip and nose.

The pain in an ordinary neuralgic attack is not constant, but subject to remissions and exacerbations of indefinite duration. The symptoms gradually decline, leaving a feeling of bruising and soreness, and may not recur for months or years until revived by some debilitating influence. On the other hand, the attacks may be extremely frequent, and become more aggravated as they increase in number. Distinct periodicity is sometimes observed in cases other than those of malarial origin.

According to the situation of the neuralgia, two great classes are formed, the superficial and the visceral.

I. SUPERFICIAL NEURALGIAS.—This is further subdivided into groups, depending upon the area affected.

Neuralgia of the Fifth Nerve (*Tic Douloureux; Prosopalgia*).—This is by far the most frequent situation for neuralgia, which usually affects one or possibly two of the main divisions of the nerve, but very rarely all three at the same time. In severe cases the pain may radiate from one division to another, and even into other nerve tracts.

The *symptoms* are those of neuralgia generally, but vary to a certain extent according to the branch affected. The vaso-motor and trophic disturbances already described are here most common, and spasmodic movements of the face are frequent in a variety of neuralgia, which has been called "epileptiform tic." This occurs in the degenerative period of life, and especially in those who have a very decided family history of insanity. It is characterized by the suddenness and intensity of the pain and its resistance to all forms of treatment, so that it generally persists for the remainder of the patient's life, which it renders almost unbearable.

Neuralgia of the Ophthalmic Division is generally referred to the supra-orbital branch, and has been called "brow ague," on account of its once frequent dependence upon malaria. Tender points may be found in some of the following situations:—A little above the supra-orbital notch, in the upper eyelid, at the junction of the nasal bone with the cartilage (long nasal branch), at some indefinite point within the orbit, and at the inner angle of the orbit (trochlear branch). The spontaneous pain is frequently very severe and exaggerated by the least muscular exertion of the neighbouring parts, so that the act of chewing, sneezing, coughing, or blowing the nose is attended with the greatest distress. The skin is often hyperalgesic, and the patient becomes unable to bear the simple pressure of his hat. Congestion of the conjunctiva, photophobia, and lachrymation not infrequently occur, and much more rarely blepharo-spasm and transient paralysis of the third nerve. Intense pain in the eye or at the back of the eyeball may be experienced alone, or in conjunction with neuralgia of the parts around. When alone, it is usually binocular and dependent to a certain extent upon some error of refraction, and especially hypermetropia. When forming part of a wide-spread neuralgia, it is, as a rule, monocular, and is sometimes associated with amblyopia and constriction of the field of vision. The paroxysms of migraine are often accompanied with a neuralgic condition of this division of the trigeminal nerve.

Neuralgia of the Superior Maxillary Division.—This nerve is much less frequently the seat of pain, which tends to be more concentrated and fixed in one of its branches than in the case of the ophthalmic division. The foci may be found where the infra-orbital nerve emerges from its canal, on the malar bone, at some indefinite point in the gum of the upper jaw, and rarely in the palate or upper lip. The paroxysms of pain are sometimes accompanied with an increased secretion from the mucous membrane of the nose and from the parotid gland.

Neuralgia of the Inferior Maxillary Division generally extends over a considerable area, and painful points may be found in the course of the auriculo-temporal nerve, a little in front of the ear, at the site of emergence of the inferior dental nerve, and rarely at the side of the tongue or lower lip. Another tender point may be present a little above

the parietal eminence, where an inosculation of various branches takes place; this and the supra-orbital are by far the most frequent foci in trigeminal neuralgia. Auditory hyperæsthesia may occur when the ear is involved in the pain.

Cervico-occipital Neuralgia occurs in the area supplied by the posterior branches of the first four spinal nerves, and of these the great occipital (arising from the second) is most frequently affected. Foci may be found on any of the branches of the cervical plexus, but are most commonly situated a little above the parietal eminence and midway between the mastoid process and the spine. The pain is often bilateral, and may radiate over the back of the neck and scalp, which it renders extremely sensitive to pressure, into the territory of the fifth nerve. It is often due to exposure to cold.

Cervico-Brachial Neuralgia.—The nerves here implicated are the posterior branches of the four lower cervical nerves and those of the brachial plexus. Tender points may be looked for in the axilla, at the inferior angle of the scapula, at the posterior border of the deltoid, in the bend of the elbow, on the outer side of the upper arm about three inches above the elbow, at the "funny bone," where the ulnar nerve passes in front of the wrist, or where the radial nerve becomes superficial on the lower and outer part of the forearm. The most common situations are the axilla, shoulder, and in the course of the ulnar nerve. In these cases the pain is usually paroxysmal and spontaneous, but is greatly intensified by muscular movements.

The most frequent causes are rheumatism and nerve injuries, which are capable of producing a true neuralgia, independently of setting up a neuritis. Dental caries has been supposed the cause in some instances.

Dorso-intercostal Neuralgia affects the intercostal nerves from the third to the ninth, and especially the seventh, eighth, and ninth. Painful points are generally to be found at the intervertebral foramen near the middle line anteriorly, and midway between these two situations. The pain is generally constant, but liable to exacerbations, which may be induced by respiratory and other movements. It is frequently associated with herpes zoster. Infra-mammary pain, particularly on the left side, is of common occurrence in anemic women, and in those who have become ex-

hausted by over-lactation or menorrhagia.

Dorso-lumbar Neuralgia is less common and the symptoms are more vague, although they bear a certain general resemblance to those of the intercostal variety. The principal foci are at the intervertebral foramina, near the middle of the crista ili, in the hypogastric region, in the groin near the emergence of the spermatic cord, and in the scrotum or labium majus. This form of neuralgia is sometimes secondary to pelvic disease. Crural and obturator neuralgias, in which pain is referred to the front and inner side of the thigh respectively, are very rarely met with.

Neuralgia of the Sciatic Nerve is probably rather rare compared with peri-neuritis of that nerve; both conditions are included under the common term, sciatica (*g.v.*). The points of greatest tenderness are found a little above the sacrum near the spine, where the sciatic nerve emerges from the pelvis, at various points along the posterior aspect of the thigh, behind the head of the fibula, and on the outer and inner sides of the ankle. The neuralgic pains in these cases are referred rather to the distribution of the nerve than to it; main trunk, and there is often a history of neuralgia in other situations.

Coccydynia.—This is a term which is used to designate pain in the region of the coccyx. It occurs especially in women, and in some instances probably depends upon neuralgia of the coccygeal plexus. Pain is most commonly excited by a long-continued sitting posture and by defecation. It frequently proves very intractable.

II. VISCERAL NEURALGIA.—This is of much less frequent occurrence than the superficial variety, but is generally of greater importance on account of the difficulty frequently experienced in diagnosing it from grave organic affections.

Cardiac Neuralgia.—Pain referred to the region of the heart is often of neuralgic origin. It is sometimes the result of abuse of tobacco, and the infra-mammary pain complained of by chlorotic girls has already been noticed. Paroxysms of deep-seated neuralgic pain are sometimes accompanied by symptoms closely simulating those of angina pectoris. The diagnosis then becomes one of extreme difficulty, and is complicated by the differences of opinion, which exist in regard to the nature of angina and the cases, which should pro-

perly be included under that head. Some indeed regard it as essentially a neuralgia, but this is probably erroneous, though it is extremely likely that some cases of so-called angina are really examples of neuralgia (*see* ANGINA PECTORIS; HEART, NEUROSES OF).

Gastralgia is one of the most definite examples of visceral neuralgia. The pain may be dull, long-continued, and liable to exacerbations, or acute and lancinating. It is referred to the region of the stomach, generally darts through to the back, and may be relieved or accentuated by the taking of food. The appetite may be lost or rendered capricious during the attacks; vomiting sometimes occurs, and constipation is the rule. Such cases are occasionally closely simulated by neuralgia of one of the intercostal nerves.

Other organs are sometimes the seat of neuralgic pains, *e.g.*, the intestines, liver, kidneys, ureters, ovaries, uterus, and testicles. The all-important symptom in these cases is deep-seated pain, which is dull, heavy and constant, or acute and paroxysmal. It is unaccompanied with any evidence of organic change, but is sometimes associated with functional disorders. There is very often a history of superficial neuralgia, and the same causes contribute towards the development of both. Among women, who are the most liable to visceral neuralgias, the most important predisposing factors are hysteria and *anæmia*.

Diagnosis.—Many cases of neuralgia present no difficulty whatever. The pain is unilateral, restricted to a certain nerve-tract, paroxysmal or constant, and subject to exacerbations; there is a history of preceding attacks, and no evidence of neuritis. Such symptoms occurring in the region of the fifth nerve are almost certainly due to neuralgia; but it should not be forgotten that pain in the same region is sometimes the result of organic intra-cranial disease, which, however, usually gives rise to other symptoms, such as headache, vomiting, optic neuritis, and convulsions.

Great difficulty may be experienced in diagnosing neuralgia of the extremities from peripheral neuritis in an early stage, especially if the affected nerve, or nerves, be deeply seated and out of reach. The occurrence at a later period of patches of *anæsthesia*, wasting of muscles with the reaction of degeneration, and of swelling and tenderness of the nerve trunk when accessible, leaves no doubt that the case is one of peripheral neuritis.

The lightning pains of *tabes dorsalis* may possibly be mistaken for neuralgia. They are, however, more fugitive and migratory, and although one of the earliest symptoms, are generally associated with some other evidence of the disease, *e.g.*, the loss of the pupillary reflex, and the absence of the knee jerks.

The pain of myalgia may be distinguished by its occurring only on movement.

When the nerves of the extremities are invaded by a growth, persistent and severe pain is experienced, combined with other symptoms, sensory and motor, pointing to structural changes in their trunks. In this case, the diagnosis from neuralgia is not therefore generally difficult; but when the same condition is present in the thorax or abdomen, the diagnosis is often one of extreme uncertainty. Thus aneurysm of the descending part of the aorta may give rise to no other symptom but pain, which is generally unilateral and persistent; but in most cases some other evidence of the nature of the disease is forthcoming. Tumours of the cord, pachymeningitis and cancer of the bodies of the vertebrae may cause pain in the course of nerve-trunks; but other symptoms of these affections are generally present, pointing to the presence of organic disease.

The diagnosis of visceral neuralgia is not one to be lightly arrived at, and can only be positively made after a most careful examination has precluded the possibility of an organic lesion.

Prognosis.—This is favourable when the patient is comparatively young, has no marked neurotic predisposition, suffers from some constitutional condition which can be remedied or removed, and when the neuralgia has resulted from some over-fatigue or exhaustion, which can be prevented in the future. The slighter forms of the disease are the most amenable to treatment. When revived, or occurring for the first time during the degenerative period of life, neuralgia is apt to prove very intractable, and may resist every form of treatment. It does not tend to shorten the duration of life.

Pathology.—This has been the subject of much debate and difference of opinion. Where is the seat of the neuralgic pains? Is it in the peripheral nerve terminations, the conducting fibres, or in the ganglionic cells of the posterior roots, or in those of the central nervous system? It is impossible to discuss this much vexed question within the limits of this

article. Suffice it to say that many considerations point strongly to its central origin, and that this view is now held by many eminent authorities.

The immediate cause of the affection is probably an instability of the central ganglionic representation of certain sensory nerve-tracts, and this may depend upon an abnormal degree of irritability of the affected centres, or upon a deficiency of their inhibition. It is possible that these centres discharge spontaneously; but it seems likely that they are also excited to action by afferent stimuli from the periphery, many of which are so slight as in no way to affect consciousness.

Ætiology.—Neuralgia is often hereditary, and very frequently there is a general neurotic predisposition, a family history of insanity, epilepsy, chorea or some other neurosis. The affection is very rare up to the time of puberty, but afterwards the tendency to it rapidly increases and it becomes very common during early adult and middle life. It is frequently developed or revived at the time of the menopause and occurs with great intensity in the early period of degeneration, when the arteries are commencing to be atheromatous. After sixty its frequency diminishes. As a rule women are more frequently attacked than men. Among predisposed subjects no cause is so powerful in producing an attack as a debilitated condition, whether it result from anæmia, over-lactation, menorrhagia, sexual excess, mental or physical over-work, worry, or from any other cause. In many such patients the slightest deviation from their normal standard of health is marked by the occurrence of neuralgia. It may also arise from alcoholism, lithæmia and lead poisoning, but in all these cases it is necessary to exclude the presence of peripheral neuritis before making a positive diagnosis. Malaria is a potent cause of neuralgia, though an infrequent one in this country. Tobacco-smoking sometimes excites an attack in people who are very susceptible to its influence. The disease is often reflex in origin and dependent upon an irritation of the sensory terminations, frequently of some other nerve; the most common illustration of this is neuralgia of some branch of the fifth nerve excited by dental caries, but the same result may ensue from such a remote cause as injury to the ulnar nerve. Herpes zoster is, except in the young, usually accompanied by neuralgia in the immediate neighbourhood of the

eruption, and this may anticipate the development of the rash by a few days. The pain is often very severe and in the old may prove very intractable and persistent. Among other occasional causes may be mentioned rheumatism, rheumatoid arthritis, hysteria, nerve traumatism and probably secondary syphilis. Of the direct exciting causes, none are so powerful as exposure to cold.

Treatment.—The indications for treatment are (1) the removal of the cause and (2) the relief of the pain.

Little need be said about the former of these beyond insisting upon the importance of the recognition and removal or treatment of the causal influence. The diet should generally be liberal, containing a fair proportion of fat, and a small amount of alcohol at mealtimes is often distinctly beneficial. Complete mental rest is necessary, especially in those whose neuralgia depends upon overwork or worry. Fresh air and moderate exercise should also be indulged in. Carious teeth should be looked for and extracted, particularly in cases of neuralgia of the fifth nerve. Rheumatism, gout, malaria and syphilis must each be treated with appropriate drugs. Iron, to which cod-liver oil may be added, is valuable not only in anæmic states, but even when there is no evidence of a deficiency of hæmoglobin. Arsenic is useful when the neuralgia is due to malaria or a cachectic condition, and also in cases of pain referred to the heart. The liquor sodæ arseniatis, in doses of ℥iij-℥viii, is often better tolerated than Fowler's solution. Quinine is most efficacious in malarial neuralgia, and should be given, in a full dose of gr. v-xx, a little before the time of the expected attack. In smaller doses of gr. ij-ijj it is sometimes beneficial in other cases, particularly when the pain is in the region of the ophthalmic division of the fifth. Nux vomica or liquor strychninæ is a valuable adjunct in many cases of neuralgia. Phosphorus has been highly recommended, and its administration is sometimes attended with marked success. It is best prescribed in capsules, or combined with cod-liver oil in the proportion of gr. j to ʒjss, of which ʒj is taken every four hours. Stimulants are often serviceable in relieving the pain, and of these the chief is alcohol. It is a dangerous remedy to prescribe, and should only be recommended when the patient seems possessed of sufficient self-control to resist taking it to excess. It must be given medicinally, in fixed quantities,

to be taken only at mealtimes. Other stimulants recommended are sulphuric ether and valerian.

For the relief of the pain, no drug is so potent as opium or morphine. Great care must be exercised in their administration, lest the opium habit be developed. Morphine is best given hypodermically, but in no case should the patient be trusted with the performance of the operation. Very small doses (gr. $\frac{1}{10}$ – $\frac{1}{8}$) have frequently the desired effect, and should be raised very gradually when necessary. Given in this way, morphine sometimes not only relieves the pain, but ultimately cures the neuralgia. Belladonna is of most value in the treatment of pelvic neuralgia, and may be given by the mouth in doses of gr. $\frac{1}{8}$ – $\frac{1}{2}$ of the extract. The hypodermic injection of atropine (gr. $\frac{1}{120}$ – $\frac{1}{60}$) is more powerful, and is advantageously combined with morphine in some cases. Cannabis indica, in doses of gr. $\frac{1}{4}$ –1 of the extract, is often beneficial in the slighter forms of the disease, and sometimes also relieves the pain of severe cases. The injection of gr. $\frac{1}{2}$ –1 of cocaine is often attended with good results.

Among other drugs recommended are gelseminum (℥xv of the tincture, frequently repeated), butyl chloral (in doses of gr. v–x or even gr. xx), and aconite (℥v–x of the tincture) in cases of trigeminal neuralgia; muriate of ammonia (gr. x–xx) in intercostal and hepatic neuralgias; bromide of potassium, in 5ss doses, when there is great restlessness and irritability and antipyrine.

Local applications are often of service in relieving neuralgic pain. One of the most successful of these is counter-irritation, which is generally applied by means of flying blisters, about the size of a florin, over the painful points or by the side of the spine.

Electricity proves very beneficial in the treatment of some cases, and the continuous current is that most generally useful. It is intended only to act as a sedative, and therefore the current should only be sufficiently strong to cause a tingling and burning sensation. Sponges moistened with warm salt water should be used as electrodes, and placed in such a manner as to bring the affected nerve within the circuit. The direction of the current may be neglected. One of the sponges should be applied successively to the different painful points, but should not be raised from the skin until the strength of the current has been lowered to zero. Each application should

last about ten minutes, and may be frequently repeated when relief is afforded. A strong current of faradism or voltaism is sometimes employed as a counter-irritant.

Other local applications are the liniments of aconite, belladonna and chloroform, singly or combined; menthol, which may be used alone or mixed with equal parts of chloral hydrate and camphor; the oleates of morphine and atropine, and the ointments of aconitine and veratrine. All these are at times of value in relieving the pain, but often prove quite useless. In a certain number of cases medicinal measures entirely fail, and the propriety of surgical interference has to be considered.

The operations of nerve-stretching and excision of a portion of the affected nerve are sometimes attended with relief, which, however, occasionally proves but temporary. Meckel's ganglion has been removed with good result in some cases of neuralgia of the second division of the fifth nerve.

WM. GAY.

NEURASTHENIA. — Literally, a loss of strength in the nervous system.

This term is now very generally employed to designate a morbid condition of the nervous system, which may manifest itself by a great variety of symptoms.

Its use has been objected to on the ground that it implies a theory, viz., that the underlying condition is one of exhaustion or asthenia, whereas, for aught that is certainly known, it may be one of excessive action or defective inhibition. Whilst admitting the objection, it may be urged that if the action be excessive it is certainly not healthy, and that, if by exhaustion or asthenia only "loss of tone" is implied, there is not much danger that such a theory will be disproved as knowledge advances.

Perhaps the best equivalent in our own language for "neurasthenia" is "nervous break-down."

The various symptoms which constitute this morbid condition have been long known and accurately described, but attention has of late been specially drawn to the subject by the marked success which has attended the adoption of a certain method of treatment, first advocated by Dr. Weir Mitchell, of Philadelphia, and generally known by his name—success which has been especially noticeable from the fact that hitherto such cases had been a veritable reproach to medicine, owing to their absolutely intractable character.

Those who have had most practical experience in dealing with these cases are disposed to restrict the terms "neurasthenia" and "neurasthenic," to a condition which is for the most part characterized by a clinical history somewhat of the following character :—

The patient is usually a woman, but the condition has been met with in men. The family history is generally "neurotic," and the history of the patient previous to the onset of the symptoms is not uncommonly marked by the occurrence of various neurotic manifestations. Then an event commonly happens—it may be an illness of a definite kind (not infrequently it is some uterine affection), or a disappointment, a fright, dyspeptic troubles, or some cause of pain—which forms the starting-point for a prolonged period of ill-health, during which the original affection is quite overshadowed by the appearance of a great variety of pure neuroses. The patient becomes, as time goes on, more and more a chronic invalid, passing most of her time in bed or on a sofa, and either remaining indoors for years or perhaps going out occasionally in a bath-chair. Dyspeptic troubles often predominate, and there may be complete loss of appetite and a professed inability to take more than a ridiculously small quantity of food, attended, as such a condition must necessarily be, by extreme emaciation and anaemia. Pain or sleeplessness usually leads sooner or later to a resort to chloral or morphine, to which drugs many of these patients become absolute slaves. There is generally a marked craving for sympathy and desire to attract attention, whilst emotional and hysterical manifestations are very common.

It is not unusual to find that such cases have been seen by nearly all the leading physicians in some particular line of practice, which will vary with the organ which appears to be specially at fault, and that little or no benefit has followed the adoption of many different plans of treatment.

In another class of case there is, instead of emaciation, an excessive formation of subcutaneous fat combined with anaemia, the mental condition being very similar to that above described.

The following description of a case under the care of Dr. Lauder Brunton and Dr. William Playfair will, perhaps, convey more clearly an idea of the class first described :—

The patient was a man thirty-three years of age, considerably over 6 feet

in height, and once very strong and muscular. His illness commenced at the age of twenty-seven, when much exposed on a ranche in America. The following is his own account of its onset and course :—"About five or six years ago I began to suffer greatly from indigestion, which reduced my strength very much, and brought on a very severe pain in the right side of the stomach, from back to front, which all the doctors seemed to agree to be neuralgia. I have the pain daily, almost hourly, and it amounts to intolerable agony. I suddenly collapsed about a year ago, and was in bed most of last year. I have now got into a regular weak state, get very bad nights' rest, can take next to no food, and very often bring up what I do take. I am simply devoid of muscle, and am nothing but skin and bone. I weighed the other day 8 stone 5 lb. pounds; I consider my proper weight to be 12 stone 10 lb."

At Dr. Brunton's request, Dr. William Playfair, who has had large experience of the treatment by Weir Mitchell's method of similar cases in women, took charge of this patient.

In eight weeks his cure was complete. In Dr. Brunton's words,* "His muscles, which had almost entirely disappeared, have not only become of a normal size, but they are as hard as pieces of wood, and from being a simple skeleton he is now a well-developed man." Photographs taken before the commencement of treatment and after it was finished show in the most striking and remarkable way the astonishing results attained. This patient, when last heard of, remained in good health.

Treatment.—As already stated, the only mode of treatment of these cases which has been attended by success is that devised by Dr. Weir Mitchell, which will be found described in detail under the heading of *MASSAGE (INCLUDING THE WEIR MITCHELL TREATMENT)*.

In the cases marked by anaemia and an excessive formation of fat, a preliminary period of semi-starvation is recommended before the usual treatment by excessive feeding is begun.

J. K. FOWLER.

NEURASTHENIA SPINALIS.

—Weakness or exhaustion of the spinal nervous system. A functional neurosis of the spinal nervous system, first described under the above name by Drs. Beard and Rockwell in 1871.

* "Disorders of Digestion," p. 79.

The condition is most commonly met with in youths and adults between the ages of twenty and thirty years, and is chiefly characterized by sensations of numbness and formication, with muscular fatigue and weakness. The subjects of the affection usually believe themselves to be suffering from some organic disease of the spinal cord. Sensations of stiffness, weariness and pain are commonly complained of, and the condition is not unfrequently associated with hypochondriasis and insomnia.

Various causes of the affection have been assigned, including all those commonly credited with producing the various neuroses, such as overstrain and sexual excesses. Erb considers that the spinal centres are in a state of exhaustion.

The condition may last for a considerable period—as long as two years; but it is doubtful whether it ever passes on to organic disease.

Treatment.—Every endeavour should be made to discover the underlying cause of the affection. Massage and electrical treatment are likely to afford relief.

NEURITIS (Peripheral Neuritis; Multiple Peripheral Neuritis).—An inflammation of a nerve.

Neuritis, to which the word peripheral is generally, though somewhat unnecessarily, prefixed, may result from poisoning by alcohol, lead, arsenic, and bisulphide of carbon. It may occur as a sequel to typhoid and typhus fevers, variola, dengue and intermittent fever, and perhaps plays a part in the causation of diphtheritic paralysis. It is sometimes due to syphilis, diabetes and tabes dorsalis, and is probably an essential factor in anæsthetic leprosy and beri-beri. Now and then cases are met with which seem to be due to over-fatigue, exposure to damp and cold, or no cause may be discoverable; all such cases are termed idiopathic.

Symptoms.—Sometimes a single nerve is picked out, but more commonly the affection is a widespread one, and several nerves of both upper and lower extremities are symmetrically attacked.

The onset of multiple peripheral neuritis is generally rather rapid, sometimes apparently sudden, though, on inquiry, one can generally elicit a history of pins and needles, shooting pains, numbness or tingling of the legs and arms, dating from some weeks or months previously. In those rare cases in which one is able to follow the case from its

commencement, the temperature may be found raised, even to 103° or 104.5° F., but it soon declines to normal. The pulse is usually accelerated and rarely under 120, though in one case described it was only 48. The complaint is usually of paralysis, which is, as a rule, symmetrical, spreading from the periphery towards the trunk and falling with much greater severity upon the extensors than the flexors. Hence it is that one of the earliest, and at the same time one of the most characteristic, of the symptoms is dropping of the hands and feet. The latter gives to the gait a high-stepping character, because the patient has great trouble in clearing the ground with his toes, which he endeavours to overcome by increasing the flexion of the thigh on the abdomen and of the leg on the thigh.

At a later stage the dorsum of the foot lies almost in a straight line with the front of the leg; the toes are flexed, and the great toe is curved downwards and tucked under the second toe. Adaptive shortening of the flexor muscles and formation of adhesions between the tendons and their sheaths may now give rise to deformities—*e.g.*, talipes equinus or equino-varus, contractures of the wrists, fingers and toes.

But meanwhile the paralysis, again attacking the extensors the more severely, has spread and affected the muscles of the thigh and upper arm, so that the patient lies in bed with his thigh flexed on his abdomen, the leg on the thigh, and the forearm on the upper arm. If, further, the muscles of the trunk and diaphragm be attacked, a fatal result generally ensues. The facial muscles are very rarely paralysed, but the ocular not infrequently, especially the external recti.

There is rapid wasting of the muscles, and their faradic excitability is either lost or diminished. The galvanic formula may be retained, but diminished and with slow contractions; or more usually the reaction of degeneration is obtained. The mechanical excitability of the muscles is sometimes normal or even exaggerated, but in the later stages is probably always lost.

Muscular spasms and tremors are extremely rare, but have been described. Occasionally there is loss of muscular sense, and in such cases the gait becomes ataxic, and much unsteadiness results from closing the eyes and putting the feet together.

The knee-jerks are absent as a rule, but in some few cases have been retained and in fewer still exaggerated. The

plantar reflex is generally diminished, delayed or gone; the cremasteric and abdominal, normal or diminished. The organic reflexes of the bladder and rectum are rarely affected, except as the result of great mental hebetude.

Various paræsthesiæ are complained of, and lancinating pains may give rise to much suffering. Hyperæsthesia of the skin is not uncommon, but gives place ultimately to anæsthesia. A hyperæsthetic condition of the muscles, so that a slight pinch causes intense pain, is a very important and extremely common symptom of alcoholic paralysis. The transmission of pain, temperature and tactile sensations is diminished. Very often the nerve trunks are found to be considerably thickened and tender to the touch, and, when the arms are affected, a painful spot may be sometimes found a little internal to the upper angle of the scapula.

Vaso-motor and trophic disorders are common, and include redness and œdema of the hands and feet, local or general perspirations, glossy skin, papulous, herpetic and bullous eruptions, perforating ulcers of the feet, affections of nails, and sometimes local asphyxia and even gangrene. Most important of all in this respect is the fact that bed-sores are extremely rare. Many affections of the eye have been described, but only two, inequality of pupils and weakness of the external recti, are at all common. The rest, nystagmus, dilatation of pupils, amblyopia, central scotoma, contraction of the field of vision, optic neuritis and atrophy, are more or less rare.

Some mental symptoms are present in most cases of alcoholic paralysis. They include insomnia, loss of memory (especially for recent events), want of power of attention and concentration, and emotional disturbances. Sometimes there is active delirium, with illusions and hallucinations, and occasionally delusions, which are narrated with much circumstantial detail and appearance of truth.

Such are the general symptoms of multiple peripheral neuritis, but considerable variety of grouping obtains according to their causation. In alcoholic paralysis the chief features are the mental symptoms, the muscular hyperæsthesia and the greater incidence of the paralysis upon the lower extremities. In lead paralysis the forearms are first and chiefly affected, the supinator longus escapes, and sensory symptoms are conspicuous by their absence. In some

cases of alcoholic and arsenical origin, ataxic symptoms predominate over the paralytic, and tabes dorsalis is closely simulated.

Diagnosis.—Multiple peripheral neuritis may be diagnosed from polio-myelitis by the presence of marked sensory phenomena, the proneness of the extensors to be first and chiefly affected, and by the grouping of the muscular lesions, which correspond roughly with the distribution of certain nerves, and not with the arrangement of the functionally related centres in the spinal cord.

Multiple peripheral neuritis differs from tabes dorsalis in that there is no Argyll Robertson pupil phenomenon and no affection of the bladder, but, on the other hand, there is generally a paralysis with the reaction of degeneration, and the lightning pains play an altogether insignificant part as compared with the analgesia, anæsthesia, and muscular hyperæsthesia.

From Landry's paralysis (acute ascending paralysis) peripheral neuritis is sufficiently marked off by the presence of wasting and degenerative electrical reactions, the marked sensory disturbances, and by the progress of the paralysis, which, as we have seen, does not attack first the legs, then the trunk, and lastly the arms.

Prognosis.—In alcoholic paralysis much depends upon how far the patient can be induced to give up the exciting cause. But under any circumstances the prognosis should be sufficiently guarded, as a fatal result is by no means infrequent. It is sometimes due to complications—*e.g.*, chronic Bright's disease and pneumonia—but most generally to respiratory paralysis.

In peripheral neuritis due to most other causes a favourable opinion can generally be expressed, and a complete cure anticipated. Sometimes, however, although the paralysis ceases to spread, the nerves fail to regenerate, and permanent contractures result.

Pathological Anatomy.—Frequently nothing abnormal is discovered until the nerves are subjected to microscopical examination, when the changes are found to be entirely parenchymatous. The medullary sheath, at first slightly swollen, is broken up into fragments, between which finely granular protoplasm and new nuclei are seen. The axis cylinder may be similarly broken up or normal. At a later stage the sheath of Schwann contains nothing but a mass of globules—the remains of the medullary sheath—

protoplasm and nuclei. The axis cylinder has disappeared, or is represented only by a fine thread. Later still, variations are found in the size of the fibres, owing to the débris contained in the sheath of Schwann having been absorbed in parts. Finally, all that remains of the medullary sheath and axis cylinder is absorbed, and nothing persists but the shrunken sheath of Schwann, with perhaps a little granular matter and nuclei less numerous than before.

In other cases the nerves are plainly enlarged and inflamed. Microscopically, the vessels are found engorged, the connective-tissue fibres and cells are greatly increased, and the nerve strands are in a similar condition to that already described, except that there is a large amount of fatty deposit, probably due to the distended vessels being unable to carry away the degenerated medullary sheath.

In extremely rare cases a segmentary neuritis exists, in which an alternation of normal and degenerated zones occurs. Such has been described in lead poisoning and diphtheritic paralysis, atrophy and fatty degeneration of muscles accompanying these changes in the nerve fibres. Usually, but at a varying time, regeneration of the nerve commences. Whether this is effected by a process of growth from the unaffected part of the nerve, or by the evolution of a new axis cylinder and medullary sheath from the degenerated mass contained within the sheath of Schwann, is still an open question, and keenly contested.

Treatment.—The general lines of treatment are often sufficiently indicated by a recognition of the cause. In the severer cases a water-bed is desirable, on account of the more equable support it affords and the comfort it gives the patient.

Salicylate of soda may be given during the initial pyrexia, and also in those cases which seem to be of rheumatic origin. Morphine is often urgently called for to allay the exquisite pains and hyperæsthesia; while, locally, hot or cold douches may be used, or lint steeped in chloroform may be pressed for a minute or two over the most painful points, or the limbs may be swathed in cotton-wool. The food must be light and easily assimilated, and in those cases in which there is much gastric disturbance nutrient enemata may be necessary. In cases due to the abuse of ardent spirits it may not be advisable at once to cut off the alcohol entirely, but it should be gradually diminished, and stopped as

soon as possible. When the acute stage of the disease has passed, strychnine or arsenic often proves useful. The patient should be encouraged to cautiously use the muscles of the affected limbs, and a properly conducted course of massage is of the greatest value at this time. Electricity also finds here one of its most beneficial applications; by its use the muscles are exercised, and their function and nutrition maintained until the nerves have had time to regenerate. One pole is put over the trunk of the nerve, and the other over the muscle, and the current is slowly interrupted. Contractions which will not respond to a long-continued massage must be treated by tenotomy, and adhesions of joints and tendons forcibly broken down.

WM. GAY.

NEUROMIMESIS.—The mimicry of organic disease by functional neuroses.

Of the various organic affections which may be simulated in functional disorders of the nervous system none is more common than disease of some joint. The position of the limb, the rigidity of neighbouring muscles, and the character of the pain are faithfully copied, but the administration of an anæsthetic generally demonstrates the true nature of the case. The pain, although intense when movement is attempted, is not, as in true joint disease, increased by pressing together the diseased articular surfaces, and other neurotic symptoms are commonly present in association with the simulated joint affection.

Treatment.—This should be conducted on the lines indicated in the article on HYSTERIA (*q.v.*). Local appliances are especially to be avoided, and the patient must be encouraged to use the limb.

NEUROSIS.—A convenient term, under which are grouped together a great variety of widely differing affections having this only in common—viz., that they are all referable to some derangement of the nervous system. The nature of the derangement is unknown. There must be no organic lesion of any part recognizable after death, either by the naked eye or by the aid of the microscope. Hysteria, neurasthenia, epilepsy, chorea, Graves's disease, neuralgia, spasmodic tic are a few of the more common neuroses. Improved methods of investigation have already done much to reduce the number, and will doubtless continue to further reduce it in the future. (*See*

HEART, NEUROSES OF; HYSTERIA; LARYNX, NEUROSES OF; NEURASTHENIA.)

NOSTALGIA (Home-sickness).—A variety of melancholia chiefly met with in young soldiers on duty abroad, and characterized by an intense longing to return home. It is chiefly seen in those coming from mountainous districts of moist climates. Great exaltation of the imaginative faculty is the first warning, accompanied, it may be, by constipation and a sense of oppression and weariness. Febrile symptoms are sometimes observed, and a gradual decline of mental and bodily power may be followed by death from exhaustion. The subjects of this disorder sometimes commit suicide. (See MELANCHOLIA.)

NYMPHOMANIA.—A condition of increased sexual excitement in the female sex, corresponding to satyriasis in males.

The *symptoms* may vary from mere extravagancy in dress, and a prurient tendency in conversation, to solicitation, suggestive attitudes, exposure of person, and masturbation. Nymphomania must be distinguished from erotomania—a disorder in which amatory conceptions predominate, but which finds neither the object nor the gratification of the desire in sexual congress. It is a disorder of the imaginative faculty, and the affection is frequently fixed upon a person of the

same sex. Pure nymphomania is a rare condition, and is allied to hysteria and hypochondriasis, but similar symptoms are not uncommon in both acute and chronic mania. The cause may be local, such as ascarides, hæmorrhoids, or pruritus ani et pudendi, or uterine disease. Foreign bodies may be found in the vagina.

NYSTAGMUS is a name given to certain rhythmical involuntary movements of the eyeballs. It is usually present in both eyes, and to the same degree. In the most common form the movements are purely horizontal, *i.e.*, from side to side, but sometimes they are rotatory. Usually, but not always, the movements are rapid. It is met with in certain local affections of the eyes, also in coal-miners who work in stooping or lying positions with dim lights, and in certain diseases of the nerve centres, *e.g.*, disseminated sclerosis and hereditary locomotor ataxy (Friedreich's disease), in which affections it differs from the ordinary form in appearing only when the patient attempts to fix his eyes upon some object. It also occurs in meningitis, thrombosis of cerebral sinuses, tumour cerebri, and in cases of hæmorrhage and softening, but is often seen apart from any other disease as a result of ophthalmia neonatorum, and in some cases it is believed to be congenital. It is common also in albinism.

O

OBESITY (Corpulence; Polysarcia).—An excessive development of fat throughout the body.

The exact degree of fatness which constitutes obesity cannot be rigidly defined; no hard-and-fast line can be drawn between the merely stout and the obese. The condition is most common in those who are past their prime, and especially amongst women at and after the climacteric; but it may be met with at all ages and in both sexes. Sometimes it is congenital, or appears very soon after birth, but in the latter case it does not generally persist for more than a year or two. Heredity certainly plays a part in its production, and the influence of the nervous system in its causation is undoubted. Corpulence is common among the gouty and diabetic.

The main exciting cause of obesity is

the ingestion of more food than is required for the due maintenance of nutrition, though it is undeniable that a great many large eaters never become corpulent, and some stout people are remarkable for the smallness of their appetites. Alcoholic drinks, especially champagne, port, burgundy, and malt liquors, have a marked effect in the production of adipose tissue. With excess of food should also be mentioned the lack of active exercise, as there is no doubt that the latter has a powerful effect in warding off the consequences of over-feeding. The taking of insufficient exercise may, in the first instance, be the result of mere laziness, but is afterwards due to physical inability consequent on the corpulent state.

The part played by the different articles of diet in the production of the fat has

been the subject of much discussion, but it is now generally accepted that no fat is produced directly from the carbohydrates, but that, when these are associated with an abundant supply of albumen, they cause fat to be separated and deposited from the albumen. The explanation of this is that the carbohydrates are very rapidly converted by combustion in the body into carbonic acid and water, and protect a portion of the albumen from total decomposition, and thus what survives is the fat. Ebstein has shown that when fats are given as food they are not nearly so liable to produce fat as are the carbohydrates, for, being less readily converted into carbonic acid and water, they do not interfere nearly so much with the decomposition of the albumen, and hence there is less probability of a residue of fat.

It must be understood that obesity has nothing to do with fatty degeneration, and that, as a rule, the viscera remain more or less free from disease, although often disturbed in their functions by mechanical causes; thus, the heart is often hampered by the layer of fat that accumulates on its surface. It is unnecessary to dwell on the symptoms of obesity further than to remark that in children the fat is mostly subcutaneous, and in older persons tends to be deposited in the deeper structures.

Treatment.—Ebstein's treatment is entirely based upon the physiological principles above referred to, his object being, in the first place, to effect a considerable reduction in the total quantity of food taken, without, however, starving the patient, and, in the second place, to select a diet which the patient will be able to adhere to for the rest of his life. The carbohydrates are absolutely forbidden, sugar, sweets and potatoes being the most important of this class; bread he limits to the smallest possible quantity, whilst he by no means forbids his patients to eat fat, and has often found that even those who formerly disliked fat could take it with relish and with relief to their dyspeptic symptoms. He allows all kinds of meat and vegetables, especially the leguminous kinds, with tea, coffee and light wines. The following is the diet-table of one of his patients:—

Breakfast.—One large cup of black tea, about $\frac{1}{2}$ pint, without milk or sugar; 2 ounces of white or brown bread toasted, with plenty of butter.

Dinner (at midday).—Soup, often with marrow; from 4 to 6 $\frac{1}{2}$ ounces of roast or boiled meat, vegetables (leguminous)

and cabbages; for second course a salad or some stewed fruit without sugar; two or three glasses of light white wine; immediately after dinner a large cup of black tea without milk or sugar, and a little fresh fruit is also allowed.

Supper.—In winter almost invariably, and in summer occasionally, a large cup of black tea without sugar or milk; an egg or a little fat roast meat, or both, or some ham with its fat, Bologna sausage, smoked or fresh fish; about 1 ounce of white bread well buttered; occasionally a small quantity of cheese and some fresh fruit.

The method which was successful in the case of the late Mr. Banting, and which now bears his name, excluded almost all fats, but gave a much larger allowance of albuminous food, and all other diets have been based on the same idea—viz., as far as possible to exclude the carbohydrates and fats.

Exercise and cold bathing are important elements of the treatment, and should be encouraged by every means. The medicinal treatment is of much less value; iron is useful, especially in cases where there is much anæmia, and iodine and the alkalies have been supposed to have a beneficial effect; the fucus vesiculosus, which has been much lauded, perhaps owes any virtues which it may possess to iodine. A purgative treatment, except on a very mild scale, cannot be recommended.

JOHN ABERCROMBIE.

ŒSOPHAGUS, DISEASES OF

THE.—**Cancer.**—Cancer as a rule affects the upper or the lower end of the œsophagus, rarely the middle. Epithelioma is the most common form at the upper end, scirrhus at the lower. The encephaloid form also occurs. The growth may infiltrate the walls of the tube or form a distinct tumour, in either case causing difficulty in swallowing solid food. Ulceration is frequent, and in some cases goes on to complete perforation.

Symptoms.—The leading symptom is a gradually increasing obstruction to the passage of food, the localization of which is obvious to the patient himself. At the outset, solid and lumpy food only is obstructed; later, even pulpy substances cannot be passed; and, finally, the channel may become impervious to liquids. In the earlier stages, the obstructed food may pass after a while; if the passage be wholly impeded, it is regurgitated into the mouth. Regurgitation from obstruc-

tion high up in the tube is almost immediate; if the growth be low down, the impeded matters may accumulate, distending the tube, their return may be delayed for many hours, and the process may closely simulate gastric vomiting. The alkaline reaction of the returned matters, and the maceration and decomposition, instead of digestion, of the food, furnish a means of distinction. Pain is usually felt in greater or less degree at the seat of the growth, if it be in the neck; in the interscapular region, if it be in the thoracic portion of the tube. In either case it will probably be aggravated by attempts to swallow, especially solid food. It sometimes shoots into the shoulders or the sides of the chest. A sense of fulness or oppression in the chest, or actual dyspnoea, may occur from pressure of the growth on surrounding parts.

As the disease progresses, the ejected matters contain much mucus, and sometimes blood.

Rapid loss of flesh and strength occurs, and the usual signs of the cancerous cachexia are manifest. Thirst is often a troublesome symptom.

Diagnosis.—The diagnosis of all forms of obstruction of the œsophagus is discussed at the end of the article.

The *course* of the disease is fairly rapid, life being seldom prolonged more than eighteen months from the first appearance of the symptoms. The posterior wall of the trachea may be infiltrated and perforated, such cases sometimes proving fatal by the supervention of gangrenous pneumonia. Perforation into the pleura may set up acute pleurisy.

Treatment in the early stages consists in excluding hard and lumpy articles from the dietary, and enjoining slow eating and careful mastication. As obstruction advances, the diet will need to be gradually reduced to liquid food. At this point rectal alimentation had better be commenced. Tonics are often of service; also cod-liver oil if it can be taken; small doses of morphine may be needed to relieve pain. If the growth have ulcerated, cocaine, in the form of a lozenge or tablet, may be of use in relieving pain and spasm. Thirst, if present, is best assuaged by acid lozenges.

When obstruction becomes total, or threatens shortly to become so, the choice must be taken between maintaining life by means of rectal alimentation or resorting to an operative procedure.

The operative procedure which offers the greatest advantages is Mr. Symonds'

method of passing through the midst of the growth, by means of a bougie, a short tube, to the upper end of which is attached a small funnel. The tube, further retained in position by a silk thread passing out through the mouth, is allowed to remain *in situ* for several days, or even for a fortnight at a time, and affords a sufficient channel for the passage of fluid food taken in the ordinary way.

Benefit is in many cases obtained by the passage of a small bougie through the growth, creating a temporary channel, or by the similar use of a gum catheter, through which fluids can be poured past the stricture; but it must be remembered that every passage of an instrument through a malignant growth is attended with a risk of perforation.

The operations of œsophagostomy in the case of a growth high up, or of gastrostomy in the case of one low down, offer other alternatives in surgical procedure, if the risk of perforation or other cause be held to prohibit any kind of intubation.

Fibrous Stricture is usually the result of syphilitic disease; more rarely, it occurs from cicatrization of wounds or simple ulcers. It may exist at any level of the tube.

The *symptoms* are the same as those of cancerous stricture, except that acute pain and ejection of blood are rarely present unless ulceration has taken place above the stricture; wasting is less rapid, and the special marks of the cancerous cachexia are wanting.

The œsophagus becomes dilated and pouched above the stricture, and sometimes ulcerated from the irritation of the obstructed contents.

The *prognosis* is more favourable than in the case of malignant stricture. The progress of the affection is towards complete obstruction, but the result may be averted, or its consequences avoided, by operative measures, the success of which enables life to be prolonged.

Treatment.—The dietetic regulations described under CANCER being enjoined, the systematic passage of bougies must be commenced, with the object of maintaining the existing degree of patency of the tube and, if possible, of increasing it. A bougie should be passed weekly at least, and attempts cautiously made to increase the size of the instrument from time to time. If pain follow the passage, its frequency must be lessened, and attempts at dilatation suspended; and if there be reason to suspect ulceration about the seat of stricture, the œsophagus

must be left quiet for a while, and rectal alimentation resorted to, in order to allow the ulcer to heal. A powder of 10 grains of subnitrate of bismuth, placed on the tongue daily and slowly swallowed, may assist the healing of the ulcer, and a small quantity (from $\frac{1}{2}$ grain) of a morphine salt may be added if there be much pain or irritation. When the symptoms of ulceration have subsided, the use of the bougie may be carefully resumed.

Should the use of the bougie fail of its object, œsophagostomy or gastrostomy, according to the seat of the stricture, will afford a chance of prolonging life.

Ulceration.—Except as a consequence of malignant disease or fibroid stricture, ulceration is rarely met with. Severe localized pain, greatly increased by attempts to swallow, and the ejection of mucus and blood, are its special symptoms. Perforation is the chief danger to be apprehended.

Treatment.—Rest may be given to the part by suspending deglutition and feeding per rectum. Powders of bismuth, with morphine if necessary, may be given as described above. The use of a bougie is attended with some risk of perforation.

Spasm (*Œsophagismus*).—More or less spasm attends all organic diseases, and especially ulceration of the œsophagus; but it may exist as a result of temporary irritation from hot or cold drinks, from irritating articles of food, or from the habitual use of spirits; it may be caused by pressure on the œsophageal nerves, or reflexly by affections of neighbouring organs, or may occur as the result of a purely nervous condition, especially in hysterical women and hypochondriacal men. The spasm may be so slight as to produce only a trifling inconvenience and delay in swallowing, or so severe as to amount to complete obstruction. It is unattended with pain, and the patient is only conscious of its existence during attempts to swallow. It sometimes yields to repeated acts of deglutition. It is occasionally accompanied by spasm of the cervical or thoracic muscles.

Treatment must be directed to the cause. If ulceration be discovered, it must be dealt with as described above. If errors in diet of a nature capable of producing spasm be detected, they must be amended. The hysterical or hypochondriacal condition must be attended to on general principles. In these last cases the systematic use of the bougie is often followed by marked improvement, a

result possibly mental rather than physical.

THE DIAGNOSIS OF ŒSOPHAGEAL AFFECTIONS.—Difficulty in swallowing is the symptom which almost invariably attracts our attention to an affection of the œsophagus. "The food sticks," is an expression commonly used by the patient. Regurgitation ("the food returns") is a frequent accompaniment. In stricture of the lower end of the œsophagus the patient's perception of obstruction may be less distinct, and regurgitation, described as *vomiting*, may be the chief or only symptom detailed. The criteria of œsophageal regurgitation are the reaction of the ejecta, which is alkaline, and the absence of the effects of gastric digestion in the articles of food brought back, which are merely sodden and partly decomposed. The dysphagia being thus localized in the œsophagus, the distinction between organic and spasmodic obstruction must be made. The gradual onset of the symptoms, their constant character and localization, and the comparative degrees of immunity found in attempting to swallow food of varying degrees of fluidity, are indicative of the former; sudden onset, paroxysmal character, shifting of situation, relief afforded by repeated efforts of deglutition, and special susceptibilities to particular articles of diet, apart from their solidity or fluidity, suggest the latter.

The presence of much mucus in the ejecta points to organic stricture; blood indicates either cancer or ulceration.

Some clue to the seat and degree of obstruction may be obtained by observing the patient as he takes food or drink, and by auscultating, while he is drinking, the left side of the spine, from the neck to the lower dorsal region. The rapid gurgle heard over the healthy œsophagus is checked at the seat of stricture, or replaced by a slow, dribbling murmur.

The presence or absence of hysterical or hypochondriacal manifestations, of evidences of syphilis and of the cancerous cachexia must be taken into account, as well as the patient's family history.

A severe, sharp, and narrowly localized pain, increased by deglutition, is the special symptom of ulceration; a deep-seated and radiating pain, that of malignant disease.

The neck and thorax must next be carefully examined for signs of dilatation of the œsophagus, as well as for morbid growths. This having been done, and the

absence of an aneurysm as far as possible ascertained, a well-oiled bougie or œsophageal tube may be carefully passed. If it meet with no obstruction, the occurrence of any localized pain in its passage, as indicative of an ulcer, should be noted. If an obstruction be experienced, the instrument should not at once be withdrawn, but by gentle persistent pressure it should be made out whether the hindrance to its passage is permanent or temporary (*i.e.*, spasmodic), partial or complete. The length of tube passed will give a rough idea of the seat of disease. Any matters brought away on the tip of the instrument should be examined microscopically for cancer cells, and also for blood and pus. The possibility of the obstruction being due to the tube passing into a diverticulum from an otherwise healthy œsophagus should not be altogether overlooked.

ISAMBARD OWEN.

OLD AGE.—The period of life in which the degenerative changes that set in after middle age become obvious.

This period does not correspond to any definite term of years. Its time of commencement is matter of inherited and individual idiosyncrasy, modified by external circumstances. It is particularly hastened by want, confinement, hardship and mental anxiety, by exposure to nitrous or mercurial fumes, and by the habitual use of morphine. Some persons may be said to be old at forty, or even earlier; others can hardly be so regarded at seventy.

The following are the more marked anatomical and physiological changes of this period of life. The bones become lighter and more brittle, without reduction in size, owing to absorption of the cancellous tissue, and, later, of the compact portions from within outwards. Fractures are in consequence more readily produced, especially in the spongy portions of the bones, and noticeably in the neck and trochanteric region of the femur. The cartilaginous parts of the skeleton are thinned, producing a slight loss of height. The alveolar processes of the jaws are absorbed, causing the teeth to loosen and drop out, and the angle of the lower jaw is enlarged. The face is thus shortened and the chin thrown into increased prominence. The voluntary muscles waste, causing a loss of athletic and respiratory power, a hesitating and staccato articulation, and an increased difficulty in maintaining the erect posture. The resulting stoop

of the back may cause a further change in the shape of the vertebrae. The cardiac muscle shares in the general wasting. The heart's beat becomes weakened and often intermittent, but its rate is not materially altered. The involuntary muscles also diminish, lessening the powers of digestion, inducing constipation, detracting from the power of circulatory and ophthalmic accommodation, and diminishing the expulsive force of the bladder. A general atrophy of elastic tissue renders the skin wrinkled and less extensible, augments the circulatory difficulty, permits of passive dilatation of the lung vesicles, and hinders the expulsion of mucus from the air sacs and bronchi, while dwindling of the gastric and intestinal glands further lessens the digestive powers. Adipose tissue is absorbed and the cutis is thinned; the cuticle and its appendages become friable and the roots of the scalp-hairs undergo atrophy, while the colour of the hair, which usually begins to be discharged in middle life, is still further lost. The lungs, the spleen, the lymphatic glands, the uterus and the ovaries undergo more or less atrophy, and the functional powers of the testes diminish or cease. They may be retained in some degree to an extreme old age. The brain and spinal cord shrink in size, reflex action becomes sluggish, the power of mental concentration and the memory for recent events markedly lessen. The fluids of the eye undergo partial absorption, lengthening the focal distance, and thus correcting myopia, if present, or inducing presbyopia in the healthy eye.

The above changes may be regarded as normal to the advanced stage of life, but the old are very subject to other degenerative alterations of tissue, which may more properly be considered *morbid*. The walls of the arteries are very liable to fibroid thickening, atheroma and calcification, by which the passage of blood is impeded. Thrombosis and embolism and a dry form of gangrene ("senile gangrene") are not infrequent results of the state of the vessels, and the risk of cerebral hæmorrhage is always present. The valves of the heart are often atheromatous or calcified, and increase the circulatory trouble. The costal cartilages in many cases calcify and become rigid, so that respiratory movements are impeded. A ring of degeneration ("arcus senilis") is often seen near the margin of the cornea, and cataract is common. The atrophy of the brain may be carried to the point of actual dementia; that

of the lungs may extend to serious emphysema. Deafness and paralysis agitans are common, and the wasting of the heart muscle becomes a source of serious danger. The joints are liable to the changes known as rheumatoid arthritis, though this lesion more commonly commences in middle life. Cirrhosis is seldom delayed to old age, but granular degeneration of the kidney not seldom commences in it. A form of glycosuria unaccompanied by special symptoms or special danger to life is often met with. The prostate is liable to fibroid enlargement, causing retention of urine and the train of results dependent on it.

Old age is to a marked degree exempt from acute rheumatism, enteric fever, diphtheria and tubercular diseases. Acute affections generally are less common than in earlier life, and, when they occur, are apt to assume an asthenic or an insidious form, and readily lapse into chronic maladies. Few aged people escape chronic rheumatism in some shape or another. Gout, though its onset is most usual in middle life, may make its first appearance at any age. Cancer is common in advanced life, but runs a slower course than when it appears at an earlier period, and in extreme old age has been known to dry up and wither. The aged are especially subject to catarrhs of the air passages, which are prone to persist and extend and to set up a form of lobular pneumonia.

Wounds in the old are liable to slough, but, apart from this risk, heal even more readily than in middle life. Fractures, except those about the neck of the femur, repair with facility.

A fatal issue may occur in old age from general enfeeblement of the vital functions without predominant lesion of any one organ. Cerebral hæmorrhage and cardiac failure are frequent modes of death, but bronchial catarrh, leading on to lobular pneumonia, is responsible for the largest mortality at this time of life.

Professor Humphry has lately shown, as the result of an extended inquiry, that longevity is, to a large extent, hereditary. Women have a greater tendency than men to long life, which is not necessarily forfeited by repeated parturition. A robust frame, a bodily and mental stature above the average, the power of sound sleep and of speedy recovery after fatigue, good reproductive power, and long retention of the hair of the scalp are the criteria of the capacity for prolonged life. Serious illnesses, as might be expected, are calculated to lessen the

prospect. The very aged are seldom found to be the offspring of immature marriages or to have contracted such themselves. The elder children of a large family appear to have an advantage over the younger.

The habits of life which, according to the same authority, most conduce to length of years may almost be summed up in the phrase, "temperance in all things." Moderate and continuous activity of mind and body, moderate and regular hours of sleep, a somewhat spare diet, little or no indulgence in alcoholic liquors, and in particular a guarded use of flesh food, are the most salient points. It is noticeable also that the very old have seldom been in the habit of resorting much to drugs during life.

In the *treatment* of aged persons, the failing powers of digestion, of repair and of vaso-motor accommodation must be constantly kept in mind.

The need of regular and sufficient hours of sleep, and of a period of rest after any unusual demand upon the brain, muscles or heart, must be duly impressed upon the patient.

The enfeebled digestive powers require a restriction of the habitual amount of food, and, in many cases, a prolongation of the intervals between meals, and between the last meal and the hour of retiring to rest. With this restricted dietary it may be advisable to have nourishment ready for administration during the night in case the patient should be awake, and to give some light refreshment, a cup of milk with tea or coffee, or one of beef-tea, immediately on waking in the morning.

The dietary of the elderly should consist in less degree of meat and in larger degree of milk and farinaceous matters than that of the young or middle-aged. The stimulus of much flesh food is neither needed by the habits nor compatible with the diminished capacity for muscular and cardiac effort of old age, while the powers of nitrogenous elimination may be readily overtaxed. Milk, owing to the diminished acidity of the gastric secretion, is better borne by the old than by the middle-aged. Fatty matters, on the other hand, are less easily tolerated, and should be taken with caution. The teeth should always be looked to, and, if they are insufficient for mastication, either artificial ones supplied or food given in such a condition as to be independent of them. Severe dyspeptic symptoms often arise from imperfect mastication in the aged.

Malted and pre-digested aliments may be required to supplement the diet as age advances, but it is remarkable upon how little food the very old contrive to support life.

Though the popular idea that old people require alcoholic liquors "to keep their strength up" is not borne out by exact observation, these liquors are of considerable service as stimulants to the failing appetite and digestion in advanced old age. White wines, as Graves, Bucellas, Marsala, and Sherry, seem to be more appreciated by the very old than the red varieties, and brandy is the most valuable form of distilled spirit (*see* ALCOHOL; ALCOHOLIC LIQUORS). Alcohol serves another useful purpose in old age in combating restlessness and inducing an inclination for necessary repose and sleep.

The reduction of the power of vascular accommodation renders the aged very susceptible to the influence of changes of temperature, which must be guarded against by the use of sufficient or even superfluous clothing, the under-garments being of flannel, and by the practice of carrying extra wraps to be used in case of emergency. Care must be taken of the head and extremities as well as of the trunk. A cardigan jacket, with close-fitting sleeves, and a light silk cap to be carried in the pocket, are useful additions to the equipment of old age, and the thickness of the foot-gear should always engage our attention. The liability of the aged to bronchitis should dictate caution in breathing cold or damp air, and the onset of catarrh of any kind should never be neglected.

The condition of the arterial walls should not be overlooked, and, if a tendency to degeneration be observed, the patient should receive a special caution against sudden or severe muscular exertion, heavy meals, and neglect of the state of the bowels (*see* CONSTIPATION).

Finally, we must never forget that the life of the aged, even when they appear to present striking examples of robust health, is held on but a frail tenure. Shocks and disturbances that would pass unheeded in earlier life may precipitate an impending and irrevocable catastrophe in an individual seemingly vigorous and well.

ISAMBARD OWEN.

OLFACTORY NERVE, DISEASES OF.—Alterations in the sense of smell may be considered under (1) Loss

of smell due to peripheral causes. (2) Subjective sensations of smell produced by central changes in the brain. Besides these two conditions, hyperæsthesia of smell, occurring in hysteria and insanity, and perverted sensations of smell have been described, but they are not of sufficient importance to require a special notice.

1. **Loss of Smell** is caused—(a) by diseases which affect the nasal cavity, such as acute or chronic catarrh of the nose, polypus obstructing the nasal passage, paralysis of the fifth nerve, producing dryness of the nasal mucous membrane—this last condition is also brought about in hemianæsthesia involving the mucous membranes of one-half of the face, due to lesions of the posterior part of the opposite internal capsule—and also occasionally by a complete paralysis of the facial nerve, which prevents the nostrils being opened in the act of sniffing. (b) By lesions involving the olfactory nerve itself, from caries of the bones due to simple meningitis or syphilis, or from abscess; the olfactory bulb or tract is also liable to be compressed or destroyed by tumours in the anterior fossa of the skull, and also to be torn by falls or blows on the head. The loss of smell may be complete or partial, and may involve one or both sides of the nose. In testing the nerve, aromatic substances such as oil of cloves, and not pungent bodies like ammonia, which act on the sensory nerves of the nasal cavity, should be used.

Prognosis in loss of smell is favourable in cases due to local causes, but in cases where the olfactory nerve has been destroyed by tumours or lacerated by injury the prognosis is necessarily unfavourable.

The *treatment* of loss of smell is that for the disease causing it. The constant current, with the negative pole inside the nasal cavity, is said to have done good in some cases.

2. **Subjective Sensations of Smell** have been observed, as warnings before some epileptic fits. They are usually described as of an unpleasant nature, such as "chloride of lime," "burning rags," or "dirty water." In some of the cases the sense of smell has not been affected, and, in those in which an autopsy has been made, a tumour has been found in the hippocampal lobule in the anterior end of the temporo-sphenoidal lobe of the same side—the part assigned by Broca and Ferrier to the sense of smell. (Cases reported by Sander and others,

and one by Dr. Hughlings Jackson and the writer, in *Med. Soc. Proc.*, vol. xii.)

C. E. BEEVOR.

OOPHORITIS (Inflammation of the Ovaries).—It is believed that the ovaries are subject to acute and chronic inflammation. Our knowledge of acute oophoritis is almost entirely derived from post-mortem examinations; chronic oophoritis, on the other hand, is a condition inferred from clinical phenomena.

The first stage is believed to be one of *hyperæmia*. This is physiological during menstruation, sexual intercourse, and pregnancy. Menstruation is often accompanied by ovarian pain; sexual excesses produce similar pain, and in pregnancy ovarian pain is common. It has been supposed that ovarian congestion may lead to hæmorrhage into Graafian follicles, interfering with their natural maturation and bursting, and thus entail sterility; but of this there is no proof. Nor is there any evidence to show that cystic disease of the ovaries is at all dependent on their congestion.

Hæmorrhage may take place into the follicles or into the stroma. How to draw the line between the normal hæmorrhage which accompanies the bursting of a Graafian follicle and a hæmorrhage slightly in excess of that, we do not know. Nor do we know why some follicles into which there has been hæmorrhage burst, and others do not; nor what are the symptoms, if any, which distended but unruptured follicles cause. There are rare cases in which the ovary is found enlarged and ruptured, in which fatal hæmorrhage has occurred. We know nothing definite about the pathology of such cases; but analogy would make us suspect them to have been due to twisting of the pedicle of a small cystoma.

Hæmorrhage into the stroma takes place in diseases in which there is a tendency to hæmorrhage, such as purpura, scurvy, typhus, septicæmia, &c. The hæmorrhage may be confined to the production of small points of effused blood, or it may be so great that the organ resembles a sponge soaked in blood. These large hæmorrhages are rare, and are probably due to obstruction to the return of blood from the ovary.

Small hæmorrhages into the ovary are probably absorbed without leaving any trace behind. Large ones may lead to complete destruction of the parenchyma

and to suppuration, the organ being converted into a brownish pulp.

Hæmorrhage into the ovary, either follicles or stroma, is not known to produce any symptoms unless rupture take place. If there be any, they are usually overshadowed by the symptoms proper to the disease which has caused the hæmorrhage, or by those which are consequent on rupture; so that it has generally been discovered unexpectedly on post-mortem examination. Hæmatoceles have been suspected to be due to this cause, but no case has been published in which such a diagnosis has been made and verified.

More advanced changes due to *oophoritis* have been described. These are of two kinds: *Parenchymatous* or *Follicular*, and *Interstitial*. They seldom exist separately, and both forms are usually accompanied by some inflammation of the surrounding peritoneum.

In **Follicular Inflammation**, the contents of the follicles become first turbid, then purulent. When extensive, the interstitial tissue becomes also affected.

Follicular oophoritis is said to be not rare in the acute exanthemata, in cholera, relapsing fever, septicæmia, arsenic and phosphorus poisoning. Occurring in these conditions, it has no special symptoms, and cannot be recognized clinically. Occasionally, cases are seen of persistent ovarian pain following one of the acute exanthemata, and possibly due to acute inflammation of the ovary during the height of the disease; but a connection of such pain with persistent change in the ovary has not yet been shown.

Interstitial Oophoritis has been described as presenting three forms or degrees—(a) serous, in which the ovary is infiltrated with serous fluid; (b) suppurative or hæmorrhagic, in which there are either yellow lines running from the hilus, or these lines have coalesced, forming small cavities containing pus; and in the tissue between these purulent collections are small capillary apoplexies; (c) necrotic. In the worst and most acute cases the organ is converted into a brown pulp, its structure being no longer recognizable.

Interstitial oophoritis may arise by the extension of follicular inflammation. Its most common cause is labour. It is then usually part of general septicæmia or pyæmia. But it may be a primary disease, existing by itself; this, however, is exceedingly rare.

Suppression of the menses, and gonor-

rhœa, are described as causes of oophoritis. There is no evidence that either of these conditions leads to any change in the substance of the ovary, although they may lead to inflammation of its peritoneal covering—i.e., peri-oophoritis.

It is believed that oophoritis may lead to the production of large abscesses of the ovary. But in cases of large ovarian abscesses it is possible and probable that they may have been suppurated cysts.

When well-marked changes, such as suppuration and disintegration, are seen, there can be no doubt of their pathological nature. But such conditions as hyperæmia, slight hæmorrhages, atrophy of follicles, thickening of the albuginea, cicatrices on the surface, are all accompaniments or consequences of the natural ripening and bursting of follicles; and we do not yet know how to draw the line between physiological and pathological changes of this kind. It has been supposed that follicular inflammation may lead to shrinking and obliteration of follicles, and to thickening of the surrounding stroma, and the formation of cysts; but of this there is no proof.

Hypertrophy of the Ovary has been described as a result of oophoritis, leading to overgrowth of the stroma with destruction of the follicles, the organ becoming enlarged, it may be to the size of the fist, but retaining its natural shape. Some might call this the production of a tumour. The connection between either hypertrophy of the ovary or solid ovarian tumours and previous inflammation has not yet been demonstrated.

Cirrhosis of the Ovary.—Destruction of the follicles, with shrinking of the stroma and puckering of the surface, has been described as a result of inflammation. A condition similar, but, it is said, less advanced, occurs in women who have had many children. We have as yet no criteria by which to distinguish between a cirrhotic ovary, the product of inflammation, and one which was originally small, and has become smaller as the result of age.

Diagnosis.—Acute oophoritis may be suspected if, in one of the diseases which are apt to be complicated by it, there be much tenderness per vaginam or per rectum in the situation of one or both ovaries. But no case has been reported in which it has been diagnosed, and the diagnosis verified. All the forms of disease which have been described are rare, even in the experience of expert morbid anatomists; and

the descriptions even in the best standard works on gynecology are based on very few cases. Until we can diagnose the affection it is unnecessary to discuss treatment.

Peri-oophoritis, or inflammation of the peritoneum covering and around the ovary, is fairly common. It may be acute, sub acute, or chronic. It leads to the formation of adhesions. These may be simply a few thin filaments, or the ovary may be imbedded in dense fibrous tissue. The ovary may be displaced and fixed in its altered position.

The most common cause of peri-oophoritis is inflammation of the tubes, either catarrhal, as from suppression of menses, or gonorrhœal. If the tubal disease persist, there may be repeated attacks of peri-oophoritis. The symptoms are those of slight perimetritis, and the signs those of perimetritis limited to the situation of the ovary: viz., a fixed tender lump at the side of and behind the uterus. Its treatment is that of perimetritis.

Chronic Oophoritis and Ovarian Pain.—Some authorities on the diseases of women teach that chronic oophoritis is very common, others seldom if ever mention it. The explanation of the apparently contradictory teaching is, that there is a group of symptoms very commonly met with, the anatomical condition underlying which is unknown. Some think that this group of symptoms warrants the inference that inflammation is present, and they call it oophoritis; others do not, and they call it ovarian pain. There is no conclusive evidence either one way or the other. The symptoms are, persistent burning, aching, pain and tenderness, lasting for months or years, varying in severity, sometimes intermitting, usually presenting a monthly exacerbation. The site of the pain is pointed out by the patient as a spot about two inches internal to the anterior superior iliac spine.

Those who think this group of symptoms justifies the inference that inflammation is present, point to its persistence and its characters, which are unlike neuralgic pain, and to its relief by treatment like that which benefits pelvic inflammation. Against this view is the fact, that no kind of chronic inflammation of the ovary has been demonstrated, either by post-mortem examination or by abdominal section, to exist in these cases. There is no doubt that symptoms like these are produced by peri-oophoritis, but in some of the worst cases of chronic ovarian pain, the uterus and ovaries

are quite movable and non-adherent. Further, removal of the ovaries does not quickly cure these patients, if it cures them at all.

There is a physical sign described by the older authors as evidence of oophoritis—viz., the occurrence, with pain and tenderness in the ovaries, of swelling, which increases, and then diminishes and disappears, the symptoms undergoing similar changes. This combination of signs and symptoms is not uncommon. But morbid anatomists and abdominal surgeons are alike in knowing little or nothing of such swollen ovaries; while they agree also in the opinion that distension of the tubes is common. It is highly probable that in these cases, assumed to be instances of inflamed and swollen ovaries, inflammation and dilatation of the tubes is the real condition.

The tenderness is ascertained by examining bimanually. The best way to feel the ovary is to put the patient on her back, to stand on the side corresponding to the ovary that is to be examined, and use for external examination the hand of that side. Then, if the patient be not too fat, or the abdominal walls too resistant, the uterine appendages can be traced outwards from the upper corner of the uterus, and the ovary arrived at, and seized between the hands.

This chronic ovarian pain is relieved by lying down, but not removed. It is aggravated by alcohol; indeed, in some cases produced by it; and this class of cases can be cured by stopping the alcohol. It is aggravated by constipation, and is lessened by tonics. It is more often in the left side, because the left side is weaker than the right as to resistance to pain as well as in muscular power.

Its most common cause is parturition. It may be consequent on dysmenorrhoea of long standing. Most chronic diseases of the uterus are accompanied by pain having this character. Morbid sexual excitement and chronic alcoholism are exciting causes. It occurs chiefly in nervous and anæmic subjects, and is associated with atonic dyspepsia, disturbed sleep, headaches, and symptoms of hysteria and nervous exhaustion.

The *treatment* is to find out and remedy any uterine disease that may be present; to administer tonics; to give such advice as may lead to the correction of anything unhealthy in the patient's mode of life; and to regulate the bowels. Alcohol

should be forbidden, unless it be clear that a small dose with meals enables the patient to digest more food. The patient should be kept recumbent while in pain, and counter-irritation used to the lower part of the abdomen, the best form being flying blisters. If the patient be free from pain while recumbent, but cannot walk without pain, support of the parts by a vaginal pessary will be found beneficial.

Prolapse of the Ovary means that the ovary is displaced so that it lies behind the uterus, in Douglas's pouch.

One or both ovaries may be so displaced, and yet be neither tender nor painful. In that case there will be no symptoms of any kind.

The ovaries, so displaced, may be tender, but not painful. In such a case there will be no suffering unless the ovaries are pressed on. The patient will then complain of pain on passing a hard motion, and of pain in sexual intercourse. The pain is of a burning aching character, and is often described as lasting an hour or so after the occasion which produced it. The treatment is to keep the motions soft with laxatives, and support the ovary, and protect it from contact by a thick india-rubber ring pessary in the vagina.

The displaced ovaries may be both tender and painful. If so, beside the symptoms above mentioned, there will be the symptoms of so-called chronic oophoritis above described.

The treatment follows from what has already been said, with the addition that a thick india-rubber ring pessary will be of marked utility. G. E. HERMAN.

OPHTHALMOPLEGIA (*Externa and Interna*).—**Ophthalmoplegia Externa**.—A progressive paralysis of the external muscles of the eyeballs, usually symmetrical, and affecting muscles associated in their action.

The term was originally applied to a condition which has since been found to be due to a degenerative change affecting the nuclei of origin of the ocular nerves. The name *ophthalmoplegia externa* is, however, frequently used to denote more or less complete palsy of the ocular muscles arising from other causes, among which may be mentioned tumours and syphilitic thickening at the base of the brain and in the orbits. The external ocular paralysis is often accompanied by *ophthalmoplegia interna*, or palsy of the internal muscles of the eye; but these conditions may occur separately.

Symptoms.—In progressive ophthalmo-

plegia externa of nuclear origin the paralysis commonly affects first the levator muscles of both upper eyelids, either simultaneously or in rapid succession. With this there is associated paralysis of the superior recti. After the lapse of time, other muscles which have a combined action are involved, such as the internal recti, or the external rectus on one side and the internal rectus on the opposite side. Occasionally, the muscles are attacked more or less irregularly, and without regard to their associated actions. When the affection is advanced, the drooping of the eyelids gives a drowsy aspect to the patient: the eyeballs are fixed, or practically so, and the patient in his endeavours to view objects out of the straight line of vision, moves his head in the required direction in a characteristic way. Occasionally, there is some protrusion of the eyeballs, though this is never extreme.

Ophthalmoplegia externa is a disease of slow course, and its duration may be as long as twenty years. The condition may exist alone, though commonly other nervous symptoms are combined with it. It occurs sometimes in association with optic nerve atrophy, or with paralysis of various cranial nerves, and it may supervene in bulbar paralysis, progressive muscular atrophy, general paralysis, and more particularly in locomotor ataxy; sometimes, and especially in the last-named disease, progressive paralysis of the external ocular muscles may occur at a very early period. Dr. Bristowe has recorded two cases in which ophthalmoplegia externa was probably of functional origin (*Brain*, Oct. 1885).

Ophthalmoplegia Interna.—This term was suggested by Mr. Hutchinson for a slow and progressive paralysis of all the internal muscles of the eyeballs. When the affection is complete, the pupils are fixed, contracting neither on exposure to light nor during efforts at accommodation; loss of accommodation from paralysis of the ciliary muscle is also present, as shown by the failure of vision for near objects.

Diagnosis.—Ophthalmoplegia may result from aneurysms, tumours or thickenings involving the nerves at the base of the brain. The existence of these conditions may be manifest from other symptoms, such as headache and vomiting. In intra-cranial growths the paralysis is usually more rapid than in ophthalmoplegia of nuclear origin, and

there is usually much irregularity in the march of the paralysis. Disease of the nuclei may be inferred when either ophthalmoplegia externa or interna exists separately, or when paralysis attacks the external ocular muscles according to their physiological grouping.

Morbid Anatomy and Pathology.—In a fatal case of Mr. Hutchinson's, in which there was paralysis of both external and internal muscles, Dr. Gowers found degeneration and atrophy of the nuclei of the third, fourth, and sixth nerves, the change resembling what is seen in progressive muscular atrophy.

Although there is little positive evidence respecting the pathological nature of the two forms of ophthalmoplegia, there are certain anatomical points which throw light on these conditions, and which may be, therefore, suitably referred to here.

In the first place, there is good reason to believe that the nucleus of the third nerve is made up of several centres having distinctive functions, and that these centres may undergo separate degenerative changes. The centre for the ciliary muscle is the most anterior, lying just in front of that which subserves the reflex action of the iris. The rest of the third nerve nucleus is concerned with the movements of the eyeballs, and there is little doubt that the centres for muscles which are associated in their action lie close together.

It may be mentioned here that the internal rectus has a double innervation. When associated with the opposite external rectus in lateral movements, it is controlled by the nucleus of the opposite sixth nerve, and hence in ophthalmoplegia externa it sometimes happens that, while there is loss of power of the internal rectus in its associated action with the opposite external rectus, the muscle acts well with its fellow in convergence.

Many of the clinical features of ophthalmoplegia, its progressive tendency, and the various combinations which occur, are intelligible in the light of these facts. It is quite conceivable that ophthalmoplegia interna may depend, as Mr. Hutchinson believes, on disease of the ciliary ganglion; but it is highly probable, from its association with external ocular palsy, that in many cases the affection is due either to disease of the nucleus or of the trunk of the nerve.

Etiology.—According to Mr. Hutchinson, syphilis is the usual cause of this disorder. Little, however, can be said on the ætiology of this affection, especially

in view of the frequent association of ophthalmoplegia with other disorders of the nervous system.

Treatment.—Iodide of potassium and mercury are mentioned favourably by Mr. Hutchinson. In most cases drugs have been ineffectual. W. B. HADDEN.

OPHTHALMOSCOPE.—In the year 1851 Helmholtz invented the ophthalmoscope, an instrument consisting of three superimposed pieces of plain glass set at an angle in a frame. With this simple appliance in front of his own eye, Helmholtz was enabled to reflect the light from a lamp into the pupil of the observed eye, and study the details of the hitherto unseen living fundus oculi. Previous to this invention the pupil had always maintained its characteristic black appearance, in spite of all attempts to see into it, on account of the fact that rays of light issue from the eye only to return to their source along the same path. Since the observer's pupil is not a source of light, he can never receive any rays from the interior of an eye.

A mirror with a central perforation, or sight hole, which soon replaced Helmholtz's original instrument, overcomes this difficulty, as it enables the observer to throw light into a pupil, and to receive some of the reflected rays, through the sight hole, into his own eye, where they form a picture of the observed fundus. This manner of examining the eye is known as the direct method, in contra-distinction to the indirect method, introduced by Ruete, in which a large concave mirror and a strong convex lens are employed.

Both methods are essential to the thorough examination of an eye, and can be conducted with greater ease if the physician uses an instrument possessing the latest mechanical improvements, such as Moreton's modification of Mr. John Couper's refraction ophthalmoscope. It consists of a body and two mirrors, each with a central hole. The body contains a large series of convex and concave spherical lenses, which can be brought by the rotation of a wheel successively in front of the sight hole. Of the two mirrors, the smaller, highly concave and set at an angle, can be rotated around its own centre; it is used in conjunction with the series of lenses for the direct method, whilst the larger and less concave is used, together with a convex lens of about 3 inches focus, in the indirect method.

Direct Method.—The examination is made in a darkened room by means of an artificial light. When the patient is in bed the light should be placed on the pillow on the side opposite to the eye to be examined. The ophthalmoscope is held erect in the right hand, and close in front of the observer's right eye when a right eye is to be examined, and *vice versa* for the left. The apex of the wedge formed by the small tilted mirror must be directed vertically upwards, and the light will then fall into the eye to be examined, as the observer, who stands opposite to the lamp, stoops over the patient.

When the patient can sit up in bed or in a chair, the light should be placed on a level with, but behind and to one side of, the eye to be examined. The observer sits beside the patient, opposite to the light, and holds the ophthalmoscope erect and close to his own eye, with the apex of the wedge formed by the small mirror directed towards the root of his nose. He can now bring the mirror so close to the observed eye as almost to touch it, and still have room to move the wheel without his hand coming in contact with the patient's face. The light will now fall on the eye, and as long as the small shadow which corresponds to the sight hole in the mirror is on the pupil, the fundus will remain illuminated and visible. If both physician and patient have normal (emmetropic) eyes, and neither accommodate, the details of the fundus should appear quite sharp and clear; if, on the other hand, either the physician or the patient have some abnormality of refraction (ametropia), then the series of lenses in the body of the instrument will have to be moved in sequence in front of the sight hole until the fundus details are clearly seen.

The lens which produces this effect will indicate the amount of the ametropia either of the one or both eyes engaged in the observation. It is, therefore, absolutely necessary for the observer to know the amount and nature of his own error of refraction, if he has any, and if it is one of any great amount it is well to have the correcting glass set in the disc provided for such extra lenses in Moreton's instrument.

Thus corrected, the physician does not require to make any allowance for his own error, and the lens found to give the clearest image of the fundus represents the patient's defect. The direct method thus serves two purposes—viz., to obtain a very magnified view of the fundus,

and also to find the glass the patient should wear to correct his ametropia.

Indirect Method.—The light may be placed on either side of the patient's head. The observer is seated in front of and at about his own arm's length from the patient. The ophthalmoscope, held by the right hand in front of the right eye, throws the light upon the examined eye by means of the large mirror. In the left hand the large convex lens (13 D) is held about 3 inches from the patient's eye. The rays reflected from the back of the examined eye pass through and are brought to a focus at or near the principal focus of this lens, where they form an inverted image of the fundus. This aerial image, situated between the lens and the ophthalmoscope, is seen by the observer through the sight hole of the mirror, and as it is situated at about the ordinary reading distance from the eye, he must either accommodate for it, or, what is better and less fatiguing, look at it through a convex lens of 4 dioptries placed behind the sight hole.

Whilst examining the right eye it is well to direct the patient to look at the tip of the extended little finger of the hand holding the mirror, when the optic disc will come under observation. To see the disc of the left eye, the patient is directed to look at the observer's left ear, and when the yellow spot is to be examined he must look at the centre of the observer's forehead. In some patients the pupils are too small to allow of sufficient light being thrown into the eye; it is then necessary to dilate them by applying a mydriatic to the conjunctiva. In homatropine and in cocaine we have two drugs, which, either separately, or, better still, in combination in a 2 per cent. solution, accomplish this perfectly, without the effect lasting so long as when atropine and some similar drugs are employed. As the paralysis of the accommodation which accompanies the dilatation is very inconvenient, it is always well to apply a drop of eserine solution, 1 per cent., at the end of the examination, so as to neutralize the mydriatic, and thus avoid an attack of glaucoma, which occasionally supervenes when the pupil is left widely dilated.

The erect image, as seen by the direct method, magnifies the fundus about fourteen times; it is, therefore, useful for seeing minute changes; whilst the inverted image, seen by the indirect method, only magnifies the fundus about four times, consequently a larger area is

seen at once, and the topography of a disease can be better appreciated. Since this latter method allows more light to enter the eye, it is more serviceable where the media are not clear, but both methods should be practised in almost every case, as each is capable of showing something that is not to be seen by the other.

Before proceeding to examine the eye in either of these ways, the physician, standing about 4 feet in front of the patient, should throw the light by means of the large concave mirror on to the pupil—the lamp being so placed as to leave the patient's face in the shade. On rotating the mirror around an imaginary vertical axis, he will notice that a part of the fundus is not illuminated, and as he moves the light from side to side across the patient's eye this shadow will be observed to move either in the same or in the opposite direction to the light.

The mirror must next be rotated around an imaginary horizontal axis so that the light may be moved across the eye in a vertical direction. If the shadow move in the same direction as the light, the eye is myopic, and a concave lens will be required to see the fundus by the direct method; if it moves in the opposite direction, the eye is either hypermetropic or emmetropic, and the fundus details will be seen more clearly through a convex lens in the former case, but no lens will be necessary in the latter. If the shadow be of different intensity or moves in opposite directions in the two meridians, then astigmatism is present. By this method, known as "retinoscopy," not only the quality but also, by the placing of trial glasses in front of the patient's eye, the quantity of the refractive error can be ascertained.

Should the fundus reflex be obstructed by a fixed shadow whilst this examination is being conducted, an opacity in one or more of the clear media must be looked for by the oblique examination. To do this the lamp is placed 2 or 3 feet to one side and slightly in front of the patient's face, the rays of light are then brought to a focus by means of the large lens, in succession on the cornea and on the surfaces of the lens and on the vitreous; by this means the position and nature of the opacity can be studied.

The chief objects to be observed in a healthy eye are the round or oval pink optic disc with its central white excavation or physiological cup, varying in shape and size, and the emerging vessels, readily recognized from their difference in colour, size, and tortuosity as arteries

and veins, the latter being darker, larger and more tortuous. The retina is invisible except for its just mentioned vessels and the slight pigmentation at the yellow spot. The red back ground of the fundus is formed by the vessels of the choroid covered by its own and by the retinal pigment, both of which vary according to the lighter or darker complexion of the individual. In the negro the fundus is nearly grey, whilst in the albino every branch of every vessel is clearly seen, and the light which streams through the sclerotic and iris, as well as through the pupil, thus gives rise to the characteristic pink eye.

These varieties of the healthy eye will soon become familiar to the observer who makes a practice even of examining only the eyes of those patients who come under his observation complaining of headache. Before long his reward will come in the discovery of an unsuspected optic neuritis or retinal hæmorrhage.

W. LANG.

OPISTHOTONOS.—An arching backwards of the trunk and head so that, in the dorsal decubitus, only the head and heels touch the bed. This condition is met with in tetanus, strychnine poisoning, hydrophobia, cerebro-spinal fever and some other diseases, and is due to a spasmodic contraction of the muscles of the neck, back and legs. In rare instances the muscles in front of the spine are affected. *Emprosthotonos* is the term used to describe the condition in which the patient's body is arched forwards, and *pleurosthotonos* when it is bent to one side or the other.

OPIUM, Poisoning by.—The *symptoms* of poisoning by opium and its alkaloid, morphine, or their compounds, do not materially differ. The main feature is a gradual and increasing stupor. At first, especially when morphine has been used, there may be a short stage of excitement with headache and dryness of the mouth, but in any case within half an hour of taking the poison drowsiness followed by stupor makes its appearance. The patient can be roused and made to answer questions, but when left to himself he at once lapses into stupor, and after a time he cannot be roused so easily, or perhaps at all. At this stage the pupils are contracted and insensible to light, the pulse, which was at first small and frequent, becomes fuller and less frequent, the breathing is slow and somewhat stertorous, the counte-

nance of a dusky pallor, and the skin clammy or bathed in perspiration. The breath may exhale an odour of opium. In cases that are proceeding to a fatal termination, the muscular relaxation becomes complete, the pulse is irregular, the breathing becomes slower and more stertorous, the intervals between each respiration becoming more prolonged. The duskiuess gives place to lividity, and the patient dies asphyxiated, the pupils sometimes becoming widely dilated towards the last. This latter sign is very unfavourable. Sometimes the patient, even after several hours of coma, rallies up to a certain point, but then relapses into a state of unconsciousness, and dies.

Vomiting is not an uncommon symptom in an early stage where a large quantity of opium has been taken by the mouth, and in a few cases convulsions have been present. It is possible that the convulsions in such cases are of an uræmic nature, for it is noteworthy that, in fatal cases, the urine has frequently been found to be highly albuminous when drawn off or examined after death, although the patient was not the subject of any form of kidney disease.

Diagnosis.—In the absence of any history of the mode of appearance of the symptoms, it will sometimes be difficult, if not impossible, to make a certain diagnosis of opium poisoning. Hæmorrhage into the pons Varolii may produce the complete muscular relaxation, the stertorous breathing, the lividity and the contraction of the pupils that are seen in the later stages of opium poisoning; and if the patient were past middle life, and presented evidence of advanced arterial disease, it would hardly be safe without any history to treat him as for opium poisoning in the presence of these symptoms. Hæmorrhage into other parts of the brain would probably be accompanied by unequal pupils or by flaccidity on one side of the body more marked than the other, or by unilateral convulsion or spasm. In alcoholism the most reliable signs would be a flushed rather than a livid countenance, and the pupils would probably be dilated. In uræmia convulsion is usually a prominent feature, coma a secondary one. In the status epilepticus the pupils are dilated. In any case where there is the slightest doubt the urine should be examined, the possibility of diabetes being borne in mind; the urine will probably be albuminous; a low specific gravity points to uræmia and granular kidneys, if high, the coma might be due to opium poisoning.

The ophthalmoscope might be of aid in a doubtful case by revealing the existence of albuminuric retinitis, but it must not be forgotten that the person might be the subject of chronic renal mischief, and yet be suffering from opium poisoning.

Post-mortem Appearances.—The viscera may be congested, but, unless the smell of opium were recognisable, the cause of death could only be surmised on negative grounds.

Treatment.—The stomach should be at once washed out; if an instrument be not at hand, emetics, such as mustard (a tablespoonful of the powder in water), or gr. xx of sulphate of zinc in water, or ipecacuanha (gr. xx of the powder in water), may be given. The patient must be roused by flapping with a wet towel, by shouting at him, and later on by walking him about if he show signs of returning stupor. Ammonia may be applied to the nostrils, and hot strong coffee may be given with the same object. The hypodermic injection of sulphate of atropine gr. $\frac{1}{10}$ – $\frac{1}{20}$ (the true physiological antidote) should never be omitted, though it must be confessed it very often fails to produce any effect. Artificial respiration should be employed if necessary. In cases of poisoning by morphine injection, the stomach pump and emetics will of course be of no avail. The importance of giving the patient rest and nourishment when a certain stage of improvement has been reached can hardly be over-estimated; many patients die after having been sufficiently roused to give their names, &c., and sometimes even after having been able to walk, and it is highly probable that such relapse is due to exhaustion.

Chronic Poisoning.—Opium when chewed or smoked in moderation probably does not do more harm than tobacco under similar circumstances, but when used to excess it produces dyspepsia, emaciation, a yellowish tint of skin and a stooping, shuffling gait; pains in the long bones are frequently complained of. In some persons the habit may be abruptly broken off; in others only a gradual change can be borne. The abuse of morphine by hypodermic injection gives rise to a train of symptoms which is detailed elsewhere (*see MORPHINOMANIA*).

OPTIC NERVE AND TRACT, DISEASES OF.—The diseases peculiar to the optic disc are congestion, inflammation and atrophy.

Congestion of the Disc.—So variable are the appearances of the healthy disc that it is extremely difficult to diagnose with certainty the slight changes which occur in the course of congestion. Indeed, unless they occur under observation, it is almost impossible in some cases to come to a definite conclusion. The colour of the disc is increased, and it has a softer and rather velvety appearance. The physiological cup participates in these changes, and, when small, may be entirely lost to view. The outline of the disc is ill-defined in its whole extent. Such a condition may ensue as the result of injuries to the eye, in retro-ocular affections of the nerve, and in the course of toxic amblyopia due to tobacco, &c. Complete resolution may occur, if so the disc regains its normal appearance and no permanent affection of sight results; frequently, however, atrophic changes take place, the disc gradually becomes paler, with ultimately a considerable loss of sight.

Tobacco Amblyopia occurs generally in men about or beyond the middle age, with usually a history of some degree of alcoholism and of nerve exhaustion proceeding from one cause or another. The amount of tobacco necessary to induce amblyopia varies with the idiosyncrasy of the individual. It may be either smoked or chewed, and is generally of a strong variety, *e.g.*, twist or shag. There is a gradual, but extensive, loss of sight, equal in the two eyes, and specially affecting the centre of the fields of vision. There may be no other symptom complained of, and, except perhaps for some sluggishness of the pupils, the eyes may appear quite normal. Sometimes, however, there is congestion of the discs. In all cases there is a central scotoma for red and green. This is best obtained by making the patient fix some object with his eyes, and moving before him small squares of cardboard of a red and green colour. It will be found that he is completely colour blind for these colours in an oval area bounded on one side by the blind spot and on the other by the fixation point, but that outside this region he readily names them correctly. If the indulgence in tobacco be persisted in, the disc eventually becomes universally pale, and an extensive and irrecoverable loss of sight occurs.

The *diagnosis* should never be difficult if the above characters of the disease be borne in mind.

The *prognosis* is good in recent cases if the patient be content to submit to the treatment; but if the condition be of

long standing, and especially if atrophic changes be detected in the discs, little or no improvement results, although absolute blindness seldom, if ever, occurs.

Pathology.—The anatomical basis of the disease is an axial neuritis of the optic nerve. A condition very similar to tobacco amblyopia sometimes occurs as an hereditary defect, in bisulphide of carbon poisoning, and perhaps also in some cases of diabetes.

Treatment consists in the absolute avoidance of tobacco, a careful limitation of alcohol, and the administration of nuxvomica or strychnine internally. Of these the first is by far the most important indication, and it will generally be found that it is easier for the patient to give up tobacco entirely than to limit himself to one or perhaps two pipes in the course of the day.

Optic Neuritis (Papillitis).—Inflammation of the optic nerve may exist alone or participate in a retinitis of albuminuric origin (neuro-retinitis). The present article deals only with the former condition. It cannot be too much insisted that, at any rate in the earlier stages, there may be no visual disturbance at all. Hence the immense importance of making an ophthalmoscopic examination in all suspicious cases of headache, vomiting or convulsions. In the later stages some diminution of sight nearly always occurs, and may go on to complete blindness. The visual defect is often not at all proportionate to the intra-ocular changes. Some of the worst cases are those in which the evidence of neuritis is comparatively slight, and, on the other hand, almost complete vision may be retained with considerable swelling of the disc. When the defect of sight is considerable, there is usually a constriction of the field of vision, and frequently some deficiency of colour sensation.

Ophthalmoscopic Appearances.—In the earliest stage, in addition to congestion of the disc, there is a cloudiness of the margin, which thus loses its definition and appears striated. The veins are rather enlarged, and, as they pass over the edge of the disc, may be seen to curve, and at this place they lose their light streak and appear darker, being, in fact, foreshortened. This is evidence of swelling of the disc, for vessels curving on a flat surface retain their light streak and are of a uniform colour. In addition to this the parallax movement may be seen. This is obtained by moving the head from side to side, when the vessels of the disc will appear to move in front

of the choroid behind. At a later period the swelling increases both in depth and extent, so that the disc may seem two or three times its normal size. The veins further increase in size, become tortuous and kinked, and are in places lost in the swelling. The arteries may be smaller than normal, and are lost to view much more frequently than the veins. Hæmorrhages and flake-like spots may sometimes be seen on the surface of the disc. Optic neuritis rarely terminates in complete recovery. More often some evidence of previous inflammation is present. The disc may be pale, the arteries contracted, or white lines may be seen to run along some of the vessels. Very often, however, complete atrophy results. The disc has a staring white appearance, and its outline may be irregular; the physiological cup is filled in and the arteries contracted. Some cases of post-papillitic atrophy show no signs of previous inflammation.

Diagnosis.—From what is known in regard to the normal variations of the appearance of the disc, it will be understood that the diagnosis of optic neuritis may be extremely difficult in its earliest stages. Of all things it is necessary not to mistake a hypermetropic haze for a neuritis of organic origin. An easily appreciable swelling of the disc is conclusive proof of the existence of neuritis, and if hypermetropia can be eliminated, so also is the concurrence of deep coloration of the disc, haziness and radial striation of its margin, so that the outline is lost in the whole extent. Optic neuritis, the result of brain disease, may be accompanied by the formation of white spots in the retina and even in the region of the macula lutea, thus closely simulating albuminuric neuro-retinitis.

Prognosis.—No definite opinion in regard to the probable effect upon sight can be formed until the swelling begins to subside. During this process sight may actually improve, but very often contraction of the vessels ensues and vision may become greatly diminished or even lost.

Ætiology.—The most frequent cause of optic neuritis is disease of the brain, whether inflammatory or neoplastic. It also results from albuminuria (generally as a part of neuro-retinitis), lead poisoning, anæmia, the exanthemata and sudden suppression of menstruation. Cases, for which no appreciable cause is found, sometimes occur and are called idiopathic. Unilateral neuritis is generally due to orbital disease but may

rarely also be found in cases of brain tumour.

The occurrence of optic neuritis in the course of meningitis is easily explained by the spread of the inflammation from the affected area, down the optic nerve to its intra-ocular termination (*descending neuritis*). Not so easy is the explanation, when it is due to some distant cerebral tumour. In these cases there is often considerable swelling, which Von Graefe considered of mechanical origin. He held that increased cranial pressure compressed the cavernous sinus and in this way dammed back the return of the blood from the eye; he further believed that this condition was accentuated by rigidity of the scleral ring. This theory was upset by the discovery of a free communication of the orbital vein with the facial, which would thus act as an overflow. Surrounding the optic nerve is a space (the subvaginal), in direct connection with the subdural space. Any increase of intra-cranial pressure, or of subarachnoid fluid would thus tend to distend this space with fluid; a condition which is found in many cases of optic neuritis and is greatest just behind the globe. The simple pressure thus induced upon the optic nerve is considered by some sufficient to explain the occurrence of optic neuritis; others invoke the aid of pathogenic germs, carried to the disc by the fluid. The mechanical theorists carefully distinguish between cases of descending neuritis resulting from meningitis and those occurring in the course of distant cerebral affections. The latter they call "stauungs papilla" or Anglicè "*choked disc*." These views still retain many adherents, but many objections to them have been pointed out and observers have sought in other directions for a mode of causation. Hughlings Jackson believes optic neuritis to be the result of vaso-motor changes set up by the irritation, due to the presence of a tumour which acts as a foreign body. This cannot be looked upon as a very satisfactory solution of the difficulty. Comparatively recent microscopic researches seem to show that in many, and perhaps in all, cases inflammatory changes are present in the whole course of the optic nerve. It is therefore supposed that interstitial inflammatory changes, or a slight meningitis occurs in the region of a tumour, spreads, affects the optic nerve, and by a descending neuritis at length reaches the disc. Why the optic nerve should be specially picked out in this process, and why cases of gross meningitis are fre-

quently unaccompanied by optic neuritis, are questions not easily answered on this theory. The subject is full of difficulty and the reader is referred to Gowers' *Ophthalmoscopy* for a masterly inquiry into the whole question.

Perineuritis is a term which has been applied to cases in which the periphery of the disc is alone inflamed; it was first described by Bouchut, who erroneously believed that it only occurred in cases of meningitis. It will be noticed that descending neuritis, choked disc and perineuritis, are in the present article grouped together under the one head of optic neuritis.

Treatment.—This is directed towards the disease of which neuritis is only a symptom. Recently Brudenell Carter has incised the optic sheath with an encouraging amount of success in some cases of great swelling of the disc.

Optic Atrophy.—This may be primary or follow upon some previously existing inflammation, *e.g.*, optic neuritis, neuro-retinitis and chorio-retinitis; it is also a sequel of embolism of the central artery.

The *symptoms* are, diminution of sight, contraction of the field of vision, which shows concentric or sector-like defects, and colour-blindness, which is sometimes the first thing noticed by patients who have much to do with colours. Green and red are seen over a smaller area of the retina than yellow or blue and are the first to be affected. Vision for yellow is usually the next to be lost and that for blue ultimately follows. The perception of white still remains, but the field is variously contracted.

Ophthalmoscopic Appearances.—Typical cases of primary and post-papillitic atrophy differ so markedly in appearance that it is possible at once to say to which class a given case belongs. Intermediate cases however occur, whose origin it is quite impossible to determine with any certainty. The appearances of post-papillitic atrophy have been already described (*vide supra*). In primary atrophy the disc is grey, its outline sharply defined, the physiological cup retained, the stippling at its base more distinct than usual, the arteries normal or only slightly contracted.

The *diagnosis* of atrophy may be as difficult in some cases as it is extremely easy in others. It is important to remember that a bright light makes even a fairly tinted disc look almost white, and hence a subdued light should always be employed in the examination of doubtful cases of atrophy. Nor must it be

forgotten that a large physiological cup may make the outer half of the disc appear as pale as in atrophy; a deficiency of colour therefore in this position is only of value when the physiological cup is small.

The *prognosis* in cases of primary atrophy is invariably bad, but a certain amount of improvement in sight sometimes occurs during the transition from papillitis to atrophy.

Ætiology.—The causes of secondary atrophy have been already considered. Those of the primary variety are mainly certain diseases of the spinal cord, and especially tabes dorsalis, in which disease the optic atrophy may anticipate the development of the ataxia by many years. Both discs are ultimately affected, but one may precede the other by several months. Atrophy also occurs in some cases of general paralysis of the insane, and rarely in disseminated and lateral sclerosis. Sometimes the disease is hereditary, and affects the male members of a family soon after puberty. Hydrocephalus is occasionally the cause of atrophy through pressure of a distended third ventricle upon the chiasma. It may also result from other local cerebral lesions—*e.g.*, meningitis and exostoses. As a monocular affection it is found in various diseases of the orbit. In a fair proportion of cases no adequate cause can be discovered; some of these no doubt develop tabes dorsalis, and others have been ascribed to syphilis, sexual excess, menstrual disturbance and diabetes.

It has been proposed by Charcot and others to distinguish, not only pathologically, but clinically, between an atrophy resulting from primary degeneration of nerve fibres and one in which these suffer secondarily to an interstitial inflammation. The present state of our knowledge hardly seems to warrant such a nice distinction. In some cases of primary atrophy the nerve is shrunken, and its constituents are wasted equally, connective tissue and nerve fibres alike. In others the nerve may be only slightly diminished in size, and marked increase of the connective elements is found microscopically, as well as wasting of the nerve fibres, and in an early stage the products of their degeneration are present. Sometimes areas of gelatinous-looking material, surrounding an artery, are found throughout the course of the nerve; the intervening tissue shows degeneration of nerve fibres, but only slight increase of connective tissue.

The *treatment* resolves itself into that

of the cause, if any be found. In primary atrophy, nervine tonics, nitrate of silver, and the interrupted current have been recommended, but their use is not often attended with much success.

Retro-ocular Affections of the Optic Nerve and Tract.—The optic nerves gain the intra-cranial cavity by the optic foramina, and, meeting soon after at the chiasma, undergo a partial decussation. The fibres supplying the temporal halves of the retina continue their course, keeping to the outer side of the chiasma, and forming the outer part of the tract of the same side. The nasal fibres, however, the more numerous, entirely cross over at the chiasma to the opposite tract. In this manner each tract contains fibres representing the temporal half of one retina and the nasal half of the other, and a lesion occurring in its course would cause a corresponding defect of vision (lateral or homonymous hemianopia). It is probable that the region of the macula lutea, where vision is most acute, is represented in both tracts. Proceeding backwards across the crura cerebri the tracts reach the posterior part of the optic thalamus, where they divide into two. The larger outer part goes to the thalamus, external corpus geniculatum, and anterior quadrigeminal body, from each of which fibres pass to the posterior part of the internal capsule, and thence to the occipital lobes by the optic radiation. The inner portion of the tract reaches the internal corpus geniculatum, and through that is probably connected with the posterior corpus quadrigeminum.

The ultimate destination of the fibres of the optic radiation is still the subject of keen controversy. Charcot holds that the fibres which pass to the corpora quadrigemina are those which have not yet decussated, and that these having united with those which have already crossed over at the chiasma, they proceed together to their destination in the cortex. According to this theory, therefore, the cortical visual centre represents the entire vision of the opposite eye, and all cases of lateral hemianopia must be explained by a lesion of the tract, either primary or the result of pressure from neighbouring regions. By this means a ready explanation is afforded of cases of functional hemianæsthesia accompanied by crossed amblyopia, and of similar symptoms of organic origin. Nevertheless, the bulk of clinical and experimental evidence tells strongly against this view. There can now be little doubt that the

occipital lobe is a half vision centre, representing the tract of the same side and corresponding halves of the retinae. A lesion in this situation would then cause lateral hemianopia. The angular gyrus is believed to be a still higher centre, combining the functions of the occipital lobes in such a manner that it represents the vision of the opposite eye to a great extent and that of the eye on the same side in a much slighter degree. Experiments upon monkeys in this region by different observers have given very contradictory results, and it has been by no means definitely proved that the angular gyrus possesses the functions here attributed to it.

Symptoms.—If any part of the nerve from the eye to the chiasma be damaged, the sight of that eye alone is affected. The pupillary reflex is sluggish, and congestion of the disc, optic neuritis, or a slowly developing atrophy may be seen ophthalmoscopically, according as the disease is inflammatory or implicates the nerve by pressure. In orbital cellulitis the motor nerves may also be affected, and they frequently recover, but irreparable damage is generally done to the optic nerve.

A lesion limited to the central portion of the chiasma affects only the decussating fibres, which supply the nasal halves of the retinae. For this reason the patient cannot see towards the temporal sides of the field of vision (temporal hemianopia). The converse condition, nasal hemianopia, is caused by a symmetrical lesion of the outer parts of the chiasma. Both affections are extremely rare. If they depend on a progressive disease, the area of vision may be still further diminished as more fibres become involved, until complete blindness occurs.

Lesion of the optic tract causes homonymous hemianopia, in which vision is lost either to the right or left, according as one or other tract is implicated. The dividing line may pass through the fixation point, but more generally it deviates to the extent of a few degrees, and then leaves the central vision intact or only slightly impaired. Usually the line of demarcation between normal vision and absolute blindness is sharply defined, but there may be an intervening zone of diminished sight. The dividing line is sometimes rather oblique and in very rare cases horizontal. The visual defect occasionally appears as a quadrant in each field; this, in some cases, represents the limit of improvement of a previous lateral

hemianopia, and in others is itself the original defect. The functions of the external geniculate body are still doubtful, but hemianopia sometimes results from disease of the posterior extremity of the optic thalamus, of the posterior part of the internal capsule, or of the occipital lobe, especially in the region of the cuneus. What clinical evidence there is supports the contention that the angular gyrus is the cortical representation of the opposite eye chiefly and of that on the same side slightly. A lesion in this region would therefore cause a marked concentric contraction of the opposite field and a slighter contraction of that of the same side. There is sometimes a contraction of the remaining half-fields in cases of hemianopia; this has been explained by supposing that the angular gyrus is subsequently invaded by a lesion originating in the occipital lobe. Hemianopia is accompanied by hemiplegia in about half the cases, by hemianæsthesia more rarely, and occasionally by defects of speech. It is also a common symptom of migraine.

Colour vision is lost proportionally with that for white in hemianopia, but sometimes hemi-achromatopsia occurs, i.e., practically a colour hemianopia, leaving the field for white intact. In this curious condition all coloured objects seen on the affected side appear grey. Such an affection conclusively points to the existence of a separate centre for colour vision.

Diagnosis.—Unilateral defect of sight, accompanied by optic neuritis or atrophy and paralysis of ocular muscles, is indicative of an orbital affection. Temporal and nasal hemianopia are characteristic of affections of the chiasma. Lateral hemianopia may result from disease of the fibres of the optic tracts in any part of their course from the chiasma to their ultimate distribution in the occipital cortex. In order to arrive at any conclusion as to the seat of the disease, other localizing symptoms, e.g., hemiplegia, hemianæsthesia and convulsions, have to be considered.

Prognosis.—This is grave as regards sight when the optic nerve is affected secondarily to some orbital mischief. Recovery from hemianopia of central origin occasionally occurs to a certain extent, but most frequently the defect remains unchanged. The chiasma and tracts are generally affected by a progressive disease, and therefore no improvement can be anticipated. The

prognosis as regards life must be founded upon a consideration of the probable seat and nature of the lesion.

Etiology.—The optic nerve may be implicated in the course of an orbital cellulitis, by pressure of an aneurysm of the ophthalmic or internal carotid artery, by hæmorrhage into its sheath, fracture of the optic canal, or thickening of its periosteum, caries of the sphenoid bone, or by a tumour originating in the bone or pituitary body. A retro-bulbar neuritis seems sometimes to be rheumatic in origin, and to result from cold. The chiasma may be affected by tumours in its neighbourhood, hydrocephalus, or chronic inflammation of the dura mater. The tract may be invaded by tumours on the inner side of the temporo-sphenoidal lobe, or arising from the base of the skull. The cerebral course of the fibres may be involved in softening, hæmorrhages, or neoplasms.

Treatment.—This depends entirely upon the nature of the original disease, of which the visual defect is a symptom.

WM. GAY.

OXALIC ACID, Poisoning by.—

—The *symptoms* produced by oxalic acid taken in a concentrated form are those of an irritant poison, and consist of a burning, sour, acid taste in the mouth, which is perceived immediately, followed by burning in the throat, gullet, and stomach, grumous and blood-stained vomit, and cramps in the limbs. The patient may die from collapse in less than half an hour. When taken in a less concentrated form there may be tetanic spasms, and when still more dilute, the patient may pass quietly into a somnolent state from which he never arouses.

In non-fatal cases there will be varying degrees of inflammation of the mouth, throat, and stomach, as well as cramps and numbness of the limbs, loss of voice, dyspnoea, and a dull red mottling of the skin in circular patches. The binoxalate of potash produces the same symptoms as the acid itself. A sudden indisposition, with symptoms of irritant poisoning, followed by speedy collapse, is characteristic of oxalic acid poisoning.

Post-mortem appearances.—The mucous membrane of the mouth and throat is whitened, the stomach contains a dark, mucous, gelatinous fluid, its mucous membrane is soft and in places abraded, the intestines are more or less congested and contracted.

Treatment.—The stomach-pump and emetics are contra-indicated, but warm

water in sufficient quantity to ensure speedy vomiting may be administered; the proper antidote is a saccharated solution of lime, a drachm of which should be given immediately and repeated frequently. Failing this, magnesia or chalk, mixed into a paste with milk, may be given. A dose of castor oil (ʒj) should be given to clear the bowels.

OXALURIA.—A persistent and copious deposit of oxalate of lime from the urine.

Oxalate of lime is a normal constituent of the urine. It is very frequently deposited as isolated crystals when the urine is slightly acid or even faintly alkaline. The crystals are always small, sometimes exceedingly minute, and occur in two forms. Their most common shape is that of an octahedron, presenting itself in various aspects; but they may also appear as dumb-bells or ovoids. The latter forms are due to the different views which are obtained when a bi-concave disc, the real shape of the crystal, rolls over in the fluid. From the analogy of other salts it seems probable that the formation of disc-like crystals is determined by the presence in the urine of some viscid substance, such as mucus. The two forms of crystal are identical in composition.

When the deposit exceeds what may be a normal amount, its naked-eye appearances are characteristic. Shortly after the urine is voided, a white mucus-like cloud is seen, which gradually settles at the bottom of the urine-glass. The upper layer of the deposit forms a wavy film-like membrane, sharply separating the deposit from the supernatant urine. On the sides of the glass, too, there are seen fine lines of crystals running in all directions.

A deposit of oxalate of lime does not disappear when the urine is heated; it is insoluble in acetic acid, alcohol and ether, but soluble in the mineral acids.

Oxalic acid is a result of the disintegration of organic substances in the body. It represents a lesser degree of oxidation than carbonic acid, which is one of the final terms of tissue metamorphosis. In the laboratory uric acid can readily be made to yield oxalic acid, and it has been suggested that the same reaction occurs in the urine; that, in fact, amorphous urates, by their decomposition, constitute the sole source of the oxalic acid of the urine. It is interesting to note, in connection with this, that the

urine of gouty subjects, which habitually deposits uric acid on standing, not infrequently for a time deposits oxalate of lime. It must not be concluded, however, that this is caused by a decomposition of the uric acid. It is much more probably due to a variation in the acidity of the urine, which favours the precipitation of oxalic acid, but not that of uric acid. The oxalic acid of the urine exists almost entirely as the lime salt, and this, sparingly soluble in water, is nevertheless somewhat freely soluble in a solution of the acid phosphate of sodium. Such a solution, however, when neutralized, deposits the lime salt in octahedral crystals. Probably the same phenomena take place in the urine. An excess of alkaline bases in the blood favours the excretion of oxalic acid, and the more lime there is present the more oxalate of lime will be deposited.

Oxalic acid administered in the food has been found to appear in the urine. It has therefore been thought, though probably on insufficient grounds, that such vegetables as rhubarb and sorrel, when taken with the food, may cause a deposit of oxalate of lime in the urinary passages.

There is no method of estimating oxalic acid in the urine which can be made use of for clinical purposes.

Clinical Significance.—The main interest of the presence of oxalate of lime in the urine attaches to the possibility of its deposition while the urine is still in the urinary passages, thus forming a calculus (*see* RENAL CALCULUS). But it has been maintained that the persistent presence of more than normal quantities of oxalate of lime as a deposit in the voided urine is associated with a definite group of symptoms. Those supposed to be suffering from the so-called **Oxalic Acid Diathesis** complain of hypochondriasis and nervous depression. They also have vague nervous symptoms, such as tingling in the limbs, anæsthesia of irregular distribution, depression of spirits, irritability of temper, headache, loss of memory, and pain in the back, while with these symptoms there may be disinclination for exertion, irritability of bladder, flatulence and other symptoms

of atonic dyspepsia. But this clinical picture may be present without the occurrence of oxalate deposit in the urine, and the deposit may co-exist with various diseases unattended by the symptoms above mentioned. Further, the occurrence of deposit of oxalate of lime in the urine is no proof that this substance is present in abnormal quantity, and, as has already been stated, there is no reliable clinical method for the quantitative determination of oxalate of lime in the urine. The deposit is due probably to an alteration in the acidity of the urine, and both this and the assemblage of symptoms described may be produced by the same causes. These causes have been fully investigated by Beneke, who showed that they lead to an impeded metamorphosis of nitrogenous substances, and consist of excessive use of nitrogenous matters and also of carbohydrates as food, together with anæmia, insufficient fresh air, and hindrances to the respiration and circulation. A definite oxalic acid diathesis, however, must now be assumed to be non-existent. The occurrence of oxaluria as an occasional phase of the gouty diathesis has already been mentioned.

Treatment.—The treatment of deposit of oxalate of lime within the urinary passages is discussed under the head of RENAL CALCULUS. The other conditions which occur in association with oxaluria demand treatment directed to a general stimulation of the metabolic processes. The diet should be arranged so as to provide for a due proportion between the nitrogenous and other food stuffs. Digestion should be assisted; in the majority of cases the atonic state of the stomach demands the administration of the mineral acids, but in other cases, where there may chance to be irritative dyspepsia, alkalies and bismuth are called for. Due exercise in the open air should be prescribed, and, if possible, change of scene and removal to a bracing climate. Not infrequently domestic worries are at the same time interfering with the general health, and the patient should be warned to avoid them if possible.

ROBERT MAGUIRE.

P

PALPATION.—The use of the hands in physical examination, so as to obtain information through the medium of the sense of touch.

CHEST.—In the article on FREMITUS (*q.v.*) the normal conditions and the significance of alterations of the various kinds of fremitus are fully described.

HEART.—The right hand should be placed flat upon the chest over the precordial region, first about the apex and then at the base; at the same time the point of the left thumb should be placed upon the right carotid artery in the superior triangle of the neck, on a level with the thyroid cartilage (just internal to the sterno-mastoid muscle). It is of importance to practise this combined palpation of the heart and the carotid pulse in order (1) to time any thrill which may be present; (2) to ascertain the relation of the apex beat to the carotid pulse, whether, as under normal conditions, the two are practically synchronous ($\frac{1}{10}$ second interval), or whether, as occasionally happens in cases of aortic regurgitation, they alternate, or whether the carotid pulse is delayed; (3) to ascertain that every beat of the heart is represented in the carotid pulse. This latter point will be further confirmed on auscultation, if, as recommended in the article on that subject (*q.v.*), the thumb be still retained upon the carotid pulse.

The position of the cardiac apex, which may or may not have already been observed on inspection, will be more definitely ascertained by palpation. It may be here stated that the importance in all cases of fixing this point accurately cannot be over-estimated, as *the position of the cardiac apex is the key to the diagnosis of nearly all affections of the chest and heart.*

The character of the impulse, whether forcible and thrusting, as in hypertrophy, or sudden, short and tapping, as in dilatation, will also be ascertained.

The force of the ventricular systole can be best estimated by pressing the point of the thumb between the ribs over the apex beat. It must be noticed also whether the impulse is due chiefly to the contraction of the left or right ventricle.

The presence of any abnormal bulging

will be noted, and especially whether or no it be a pulsating swelling.

ABDOMEN.—During the act of palpation of the abdomen the patient should lie upon the back with the legs fully extended, and the shoulders slightly raised. If the abdominal walls be rigid, it is rarely of any use to make the patient flex the thighs upon the abdomen, as a rule, the effect of so doing is to render the muscles more tense than before; it may, however, be of service when the psoas muscles are in a state of undue tension. Rigidity of the abdominal wall may often be overcome by making the patient take a succession of deep inspirations, the chest being as much as possible emptied of air between each act. At first slight resistance is maintained as the abdominal walls rise owing to the descent of the diaphragm; but immediately expiration begins the hand is quickly pressed downward as far as possible, and is maintained in its position. Greater resistance is then offered to the rise during the next inspiration, whilst with the following expiration the hand is pressed still further downwards. In this way it is generally possible to overcome rigidity, unless it be due to inflammation of the underlying peritoneum. If there be no rigidity, the fingers of one or both hands (the fingers being slightly flexed and in contact) should be employed in palpation, quick movements of flexion being constantly made, by which means any fluid in the cavity is suddenly displaced, and a solid organ or tumour, if lying near to the surface, is easily felt.

When it is desired to ascertain the lower limits of an organ, such as the liver or spleen, the hand should invariably be placed on the abdominal wall below the margin of the organ, and *gradually moved upwards*, never in the opposite direction. A marked difference in the resistance is almost always noted as soon as the organ is reached, even if its margin be not distinctly felt. In "mapping out" any organ it is approached in this way from all sides; and the spot where the edge is felt is marked with ink or an aniline pencil.

In the case of an abdominal tumour it is very important to place the whole hand flat upon the abdomen over the

tumour, in order to ascertain its consistence, outline, and degree of mobility.

In the article on **FLUCTUATION**, the method of ascertaining the presence of fluid in the peritoneal cavity is fully described.

Pain may be complained of on palpation, when due to hyperæsthesia of the surface the slightest touch may cause intense suffering, whereas if the patient's attention be distracted by conversation, deep pressure may be made without so much as attracting attention to the spot.

J. K. FOWLER.

PALPITATION is usually a subjective symptom, the patient complaining that he feels the beating of his heart. The action of the heart may be found to be tumultuous or only forcible, or nothing abnormal may be detected as regards the force, frequency, or regularity of its action. It is usually present at some period in organic disease of the heart, and may then be a symptom of failure of compensation or of degeneration of the cardiac walls. In functional affections of the heart, as seen in Graves's disease, or in hysteria, it may be constant or occur in paroxysms, whilst in a considerable number of the cases in which it is present it is dependent upon indigestion. Gout, nervous exhaustion, venereal excesses, the abuse of alcohol, tea, coffee, and tobacco are also common exciting causes of this condition. When due to valvular disease it is generally increased on exertion, whilst in other cases it may be relieved by moderate exercise, and in gastric cases it is often worst when the patient is in bed. Even in cases of heart disease it is often dependent on the condition of the stomach, and will be relieved by treatment directed accordingly. (*See also* **HEART, DISEASES OF MUSCULAR WALLS, and HEART, NEUROSES OF.**)

PANCREAS, DISEASES OF.—

Diseases of this organ are uncommon, and are often unrecognized.

The following conditions are here described:

1. **Obstruction of the Pancreatic Duct.**
2. **Cancer of the Pancreas.**
3. **Acute Pancreatitis.**
4. **Pancreatic Hæmorrhage.**
5. **The Celiac Affection of Children.**

1. **Obstruction of the Pancreatic Duct.**—*Symptoms.*—The absence of pancreatic juice from the intestines, owing

to complete obstruction of the pancreatic duct, produces a condition of the feces which is characteristic; the stools are copious, loose, putrescent, greasy and stone- or clay-coloured. The presence of fat in the stools has long been recognized, but the significance of the pale colour has been only recently pointed out by Dr. T. J. Walker.

Beyond this condition of the stools there appears to be no constant symptom; epigastric pain may be slight, of short duration, or absent; glycosuria has been observed in some cases, and there may be considerable emaciation and debility. On the other hand, complete obstruction is not incompatible with long life, the patient continuing to pass the characteristic stools for many years. In a few cases the obstruction has been followed by the formation of large cysts, which have been mistaken for ovarian cysts. Such a cyst, if of moderate size, presents a rounded elastic or fluctuating tumour beneath the right costal border; pulsation may be transmitted from the abdominal aorta, and a blowing murmur may be heard over it from pressure on the same vessel. Percussion may be sub-tympanic owing to interposition of intestine. In other cases the cyst presses forward under the right lobe of the liver, and the physical signs are then very obscure.

Pathology.—In man the pancreatic juice is conducted into the duodenum by a single main duct—the duct of Wirsung—but small supplementary ducts draining a few acini may open independently into the intestine. For the last inch or more of its course the duct of Wirsung is in intimate relation with the ductus communis choledochus, and opens with it by a common orifice about three inches below the pylorus. The action of the pancreatic juice on the chyme is three-fold—(1) it transforms starch into sugar and dextrin; (2) it acts upon albuminous bodies, producing in the first place soluble peptones, in some portion the peptones are further converted into leucin and tyrosin, and finally a number of bodies belonging to the aromatic series are formed, among these are phenol, indol and skatol, the characteristic odour of the feces being mainly due to the two last-named bodies; (3) it emulsifies and assists in the saponification of fats. The pancreatic juice decomposes neutral fats into fatty acids and glycerine; the fatty acids thus set free combine with the alkalies of the pancreatic juice and the alkaline bases

of the bile salts to form soaps, and the liberated bile salts continue the process of saponification by saponifying neutral fats which may be present in the intestines. Recent researches show that the presence of bile also renders the pancreatic digestion of starches and albumens more rapid and complete; the two secretions therefore are in their function intimately related, and in some degree complementary to each other.

The colour of the fæces is mainly due to altered bile-pigments, of which the most constant and important appears to be stercobilin, nearly related to urobilin, which is the chief urinary pigment.

If owing to obstruction of the pancreatic duct the secretion of the gland be no longer poured into the intestine, the above facts would lead us to expect that the fats, which are unaffected by salivary or peptic digestion, failing to be emulsified or saponified in the intestines, would be found unaltered in the fæces, and that nutrition would suffer owing to imperfect digestion of starchy and albuminous foods. The absence of bile pigments from the intestines would explain more or less completely the pale colour of the stools. It remains therefore to account for the sudden disappearance of bile. That this is not due to arrest of secretion appears to be proved by the fact that jaundice may be entirely absent or may be present temporarily, showing that the liver has not ceased to form bile, an hypothesis which it would be, on general grounds, impossible to accept. The only remaining hypotheses are that the bile pigments and its derivatives are re-absorbed in, probably, the small intestine, or destroyed; it is known that stercobilin "accompanied by imperfectly changed biliary pigments is taken up by the branches of the portal vein and carried into the liver, where it is probably again changed by the action of a ferment into a chromogen" (McMunn), whereas there appears to be no analogy for the other alternative. Claude Bernard found that destruction of the pancreas produced symptoms exactly parallel, and made the observation that the bile alone only gave a light yellow colour to the fæces, whereas when the pancreatic juice was also present the colour was a distinct brown. "The pancreatic juice," he concludes, "therefore contributes indirectly to the coloration of the fæces."

Morbid Anatomy.—Obstruction of the pancreatic duct may be due to impacted calculus, to cicatricial contraction after ulceration, or to pressure by a tumour or

enlarged glands. The calculi may be spherical, oval or branched, single or multiple; they are composed of carbonate of lime, or of a mixture of carbonate, phosphate and oxalate. The duct and its branches become dilated, and the gland tissue undergoes a process of fatty degeneration with some accompanying fibrous overgrowth. The dilated branches of the duct may form sacculi; one or more of these sacculi may become much enlarged, forming a distinct cyst, which may attain large dimensions so as to be capable of containing several litres of fluid; the walls of these large cysts are lined by friable phosphatic concretions, and the fluid contained in them is frequently of a chocolate colour owing to hæmorrhage.

Treatment.—This has hitherto been mainly symptomatic; benefit is believed to have been derived from the administration of pancreatin.

Large cysts have been successfully treated by laparotomy performed in two stages. The first stage consists in producing adhesive inflammation between the cyst and the abdominal wall, thus closing the peritoneal cavity; the second in opening and draining the cyst with antiseptic precautions.

2. Cancer of the Pancreas is either secondary to growths in the stomach, gall-bladder, liver, or duodenum, or, more rarely, primary; in either case it usually begins in the head of the gland, and is commonly of the scirrhus variety.

Symptoms.—Emaciation is generally an early symptom, and is very rapid in its progress. There may be deep-seated burning pain in the epigastrium, with occasional exacerbations of a neuralgic character; the pain is relieved by relaxing the abdominal muscles; it is not aggravated by food, nor relieved by pressure. A pancreatic tumour presents at the right edge of the epigastrium just below the ribs, but often it pushes the edge of the liver in front of it, in which case a distinct tumour may not be apparent; in either case the percussion note is not absolutely dull. Pressure on, or secondary involvement of, the common bile duct generally ensues sooner or later, and then jaundice is extreme and persistent. Ascites from pressure on the portal vein, anasarca from pressure on the vena cava, or both conditions, frequently occur. Dyspeptic symptoms are often severe, and nausea and vomiting cause much distress; constipation is the rule.

The *diagnosis* is often difficult; rapid

emaciation, with fatty stools, deep-seated epigastric pain, and a tumour in that situation not freely movable. make the diagnosis highly probable in the absence of jaundice, but all the symptoms may be produced by a growth in the hilum of the liver. As in either case the prognosis is hopeless, the differential diagnosis is not of much clinical importance, and is often impossible; the tumour of cancer of the stomach is more movable, hæmatemesis is generally present, and vomiting occurs early in the disease; cancer of the transverse colon is, at some period of the case, generally more movable, there is hæmorrhage from the bowel, pain aggravated some hours after food, and often chronic obstruction; in cancer of the gall-bladder the tumour is more superficial, defined, and rapid in growth, and there are attacks of biliary colic; a merely distended gall-bladder may be recognized by its pyriform shape and fluctuation, while a bladder containing gall-stones is, though hard, nearly painless. Aneurysm of the aorta or celiac axis may be confounded with malignant disease of the pancreas, but in the latter case the pulsation is not distensible, and disappears when the patient is placed on his elbows and knees; in addition, the course of the symptoms is entirely different. Cancer must also be distinguished from *cyst* of the pancreas; the latter may be produced by pressure or by calculi impacted in the duct. Such cysts are occasionally met with, and have been cured by incision and drainage; but it must be remembered that they may be produced by the pressure of malignant disease of the pancreas itself or of the liver.

In a certain proportion of cases of diabetes the pancreas has been found to be the seat of fatty degeneration; calculi and cancer have also been met with, and an attempt has been made (Lancereaux) to constitute a special variety of diabetes in which there is degenerative disease of the pancreas, accompanied by, perhaps in all cases, disease of the celiac plexus. This is said to be characterized by a rapid course, diarrhœa and greasy stools, containing scraps of undigested nitrogenous food.

3. **Acute Pancreatitis.**—The pancreas is liable to become acutely inflamed, probably by extension from the duodenum.

Symptoms.—These generally commence quite suddenly, severe epigastric pain followed by nausea, vomiting, tenderness in the epigastrium, and tympanitic swelling in the same region being the

most prominent; there is marked prostration, and death may be due to collapse.

Diagnosis.—This is very difficult. The condition must be distinguished from irritant poisoning, and from perforation of the stomach and duodenum, chiefly by the history. Diarrhœa is often present, and serves to distinguish pancreatitis from intestinal obstruction, with which, if constipation exist, it is otherwise very liable to be confounded.

The morbid appearances vary with the stage and intensity of the inflammation; three forms have been described (Fitz)—hæmorrhagic, suppurative, and gangrenous. When suppuration occurs the pus may find its way into the stomach, the duodenum or the great omentum.

Hæmorrhagic Pancreatitis appears to be the most acute form of inflammation; it usually leads to death in two to four days, but if the patient survive, the whole gland may slough, and eventually find its way into the intestine and be discharged per anum. *Gangrenous Pancreatitis* may also be due to ulceration and perforation of the gastro-intestinal or biliary tracts.

In cases of acute pancreatitis it is usual to find in the sub-peritoneal tissue of the omentum, mesentery and pancreas scattered areas of fat necrosis, which vary in size from a pin's head to a hen's egg.

No *treatment* is known to have any effect on this rare disease.

4. **Pancreatic Hæmorrhage** is a rare cause of sudden death. The patient is seized by sudden collapse which may, or may not be preceded by abdominal pain, death may occur within half an hour or less. After death diffuse hæmorrhage or multiple circumscribed extravasations are found in the pancreas, in the surrounding sub-peritoneal tissue, the omentum, the mesentery, and the perinephric fat. The sudden collapse appears to be produced reflexly through the medium of the sympathetic nerve.

Etiology.—The causation of this hæmorrhage is obscure; it may possibly be due to rupture of small aneurysms, analogous to those which are frequently the cause of fatal hæmoptysis, but none have been found in any case.

5. The "**Celiac Affection of Children.**"—There is a disorder not very rarely observed in children under the age of five years, which may be mentioned here since it is most probably due to a temporary suspension of the functions of the pancreas. It is character-

ized by the passage of large, loose, white or greyish, frothy and intensely fetid motions once, twice, or thrice a day. The appetite is poor, the abdomen large and doughy; the child suffers from abdominal pain, and gradually becomes anæmic and debilitated without much emaciation. Intercurrent attacks of watery diarrhoea are frequent, and contribute to produce a degree of exhaustion which may end in death. No lesion of the pancreas or its duct has been found post mortem, but it is doubtful whether sufficient attention has been given to this point.

Treatment.—Cows' milk should be replaced by goats' or asses' milk, or by a mixture of cream and scalded whey. The principal meal should consist of raw meat freed from fat, pounded and rubbed through a hair sieve; one to four table-spoonfuls may be given according to the age of the child, mixed with sifted sugar, or fruit jelly with a pinch of salt. If this be not well taken it may be replaced by the juice extracted from raw meat by dilute hydrochloric acid. Malted food with well-cooked rusks and some butter may also be allowed. The general hygienic surroundings should be inquired into, and the trunk and limbs should be clothed in woollen garments. As to drugs papaine is often useful; it is best given in powder shortly after milk has been taken (papain gr. j, sodii, gr. ij, saccharin, gr. $\frac{1}{12}$); pancreatic milk also would appear to be indicated.

Intercurrent attacks of watery diarrhoea are best controlled by large doses of bismuth combined with a few drops of tincture of opium or the compound tincture of camphor, or in powder with pulv. kino co. DAWSON WILLIAMS.

PARACENTESIS means literally a piercing or pricking through. The name was applied by Galen to the operation of tapping in cases of dropsy or of couching for cataract, and it is now in medical language synonymous with the English word "tapping," the object being the removal of fluid.

In former times the operation of tapping was much more restricted than it now is, the larger cavities of the body only being dealt with. But since the introduction into medical practice of improved instruments, it has been employed very freely both as a means of diagnosis and treatment. In illustration of this it is only necessary to refer to the tapping of joints distended with effusion, of hydatid cysts, abscesses of the liver

and the like. In this article it will be considered only as regards the thorax, abdomen and cranium.

Paracentesis may be performed with a simple trocar and cannula; but it is best, in the case of the pleura and pericardium at least, to use an aspirator, to guard against the entrance of air.

Paracentesis Thoracis or Thoracocentesis may be very well effected by means of a large syringe having such a stop-cock arrangement that when the tap is turned in the direction of the long axis of the syringe the way is open towards the chest; when at a right angle to this the way is closed towards the chest and opened towards the outside; and when turned half-way between these points the stop-cock is air-tight for the production of a vacuum. The syringe is composed partly of glass, so that it may be at once seen whether fluid flows into it, and it has an air-tight piston, which, when pulled out, is fixed by a turn of the handle. It is connected to the cannula by an india-rubber tube, from about the middle of which another tube, protected by a metal tap, passes at a right angle. When the apparatus is used, the vacuum being made in the syringe, the tap opening the way from the chest is turned on and the syringe soon nearly fills. The tap to which the other tube is attached being then opened, the fluid flows into a vessel placed on the floor until a sufficient quantity has been removed, the tube acting partly after the manner of a siphon. Or a Potain's aspirator may be used, in which the vacuum is created in a bottle which may be graduated so that the quantity of fluid removed may be read off as it flows.

Cases of aspirating apparatus are provided with trocars and cannulae of various sizes, and it is best to use one of small diameter, say from $\frac{1}{32}$ to $\frac{1}{16}$ inch. The idea that small cannulae are more apt to become plugged by fibrinous masses than those of larger calibre is erroneous, the converse being more nearly correct. If plugging does occur, the trocar, or, what is better, a blunt-ended stilette, must be passed through to clear the tube.

One or two preliminary precautions must be attended to. In the first place, it need hardly be said that the puncturing instrument, and indeed all the apparatus, must be scrupulously clean. To this end some strong hot antiseptic solution should be used, and, in addition, the trocar and cannula should be rubbed over with carbolized oil and passed through the flame of a spirit-lamp. In the second

place, the whole apparatus should be put together and tested to see that every part of it is air-tight. It should also be seen that the collar of the cannula fits closely round the neck of the trocar; otherwise, unnecessary pain may be caused in making the puncture; and when the instrument enters the chest, it may carry the parietal pleura or a lining of lymph before it, and so fail to reach the fluid at all.

Before the operation is performed, it is well to freeze the skin, so as to diminish, if not abolish, the pain of the prick. This may be most conveniently done with a small piece of ice cut flat with a knife, the flat surface measuring about an inch square. The ice is dipped in salt, held in the corner of a towel or handkerchief, and applied firmly for half a minute or less to the spot which has been chosen for the puncture. When the ice is removed, the skin will be found frozen and insensitive, and, having been wiped free from salt and moisture, it is ready for the operation. As to the place for puncture, there is considerable latitude of choice, but none is better than the sixth or seventh interspace on the left, and the sixth on the right side in the mid-axillary line. A spot posterior to this is often selected—namely, in the seventh or eighth interspace, just outside the inferior angle of the scapula. There is, however, this objection to it, that although fluid may be undoubtedly present, it is not always reached. The reason of this, as long ago suggested by Fraentzel, probably is that the cannula becomes blocked by flakes of coagulated fibrin adhering to the thoracic wall. A dull percussion note must, of course, be found at the spot selected.

In making the puncture the operator should press the tip of the forefinger of the left hand firmly into the intercostal space, and plunge the trocar, at a right angle to the surface, quickly through the chest-wall alongside his finger, causing it to enter the interspace close to the upper border of the rib, so as to keep as far as possible from the line of the intercostal vessels and nerve. The skin should be drawn aside a little when anything but a fine instrument is used for the puncture.

It is very desirable to draw off the fluid slowly (hence the importance of a *small* cannula), so as to allow the lung an opportunity of gradual re-expansion. If this precaution be attended to, syncope need not be feared, and it does not much matter whether the patient be sitting up

in bed or lying down. When severe cough is set up, or a feeling of tightness in the chest is complained of, or blood-staining appears, the removal of fluid should be stopped, the cannula withdrawn, and the wound covered with a pledget of cotton-wool dipped in collodion and kept in its place by strapping.

It is a good plan to make a preliminary incision through the skin before using the trocar, especially when the skin cannot be rendered anæsthetic by freezing, or when it is necessary to employ a trocar and cannula of somewhat large size. If, on emergency, an aspirator cannot be got, and an ordinary small trocar and cannula have to be used, a piece of goldbeater's skin must be tied to form a valve round the end, or some other similar arrangement made to prevent the passage of air into the chest. In the case of nervous persons and children, it is well to use a general anæsthetic, and chloroform is best suited for the purpose. The freezing of the skin is then, of course, unnecessary.

Paracentesis Abdominis may be performed with an ordinary full-sized trocar and cannula, but the plan introduced by Dr. Southey, of using a very small instrument (capillary, so called), by means of which the fluid is very slowly removed and the risk of syncope obviated, is much to be preferred.

The best spot for puncture is in the middle line, half-way between the pubes and umbilicus, care being taken that the bladder is empty and an undoubtedly dull note on percussion obtained at this point. The instrument is pushed with a stabbing motion through the parietes into the peritoneal sac, the trocar is withdrawn, and a fine india-rubber tube affixed to the end of the cannula, and also fastened by a strip of plaster to the skin to prevent kinking or displacement. This tube is long enough to pass over the side of the bed to a vessel placed on the floor, into which the fluid gradually runs. From four to six hours generally suffice to get all the fluid away. When the flow has ceased, the cannula is withdrawn and the wound closed, as in the case of the thorax. With the larger instrument and more rapid emptying of the peritoneum, a bandage or binder should be used, and gradually tightened, to give support to the abdominal wall as the fluid diminishes, and so avert the risk of syncope. When the small cannula is used this is unnecessary, but a binder should be applied after the

operation, and should be left on for some days.

Paracentesis Capitis is occasionally practised for the removal of effusion in cases of chronic hydrocephalus, but very rarely indeed with any substantial benefit. For the operation a very fine trocar and cannula or hollow needle should be used, and the puncture should be made in the neighbourhood of the anterior fontanelle to one side of the middle line so as not to wound the longitudinal sinus. It is generally recommended to remove only a small quantity of fluid at a time, and to counteract the diminished internal pressure by the application of an elastic bandage. The aspirator must not be used in this operation.

Paracentesis Pericardii.—A state of affairs calling for puncture of the pericardial sac is much less frequent than in the case of the pleura or peritoneum; nevertheless, the operation has been occasionally performed with great advantage. The aspirator should be used with a very small trocar and cannula or hollow needle. The best spot at which to make the puncture will vary somewhat with circumstances. Generally speaking, it will be found to be the fourth interspace, right or left, as close as possible to the sternal border. In this situation the thoracic wall will be pierced to the inside of the internal mammary vessels. A lower interspace should not be chosen unless the puncture be made an inch or more from the border of the sternum. It is not safe to puncture close to the sternum in the fifth space, as one or other of the internal mammary vessels or a branch may be pierced.

If the presence of pus be suspected, it is best to make the puncture well outside the vessels, say $1\frac{1}{2}$ inch from the border of the sternum, so that the cannula may serve as a guide to the knife by which a free incision may subsequently have to be made. If the trocar or needle should have been introduced close to the sternal margin, it could not be properly made use of in this way, inasmuch as an incision of sufficient length outwards would divide the internal mammary vessels, and troublesome hæmorrhage would result. In this case the left side of the chest should be chosen for the operation.

Paracentesis Pulmonis.—This is done as an exploratory operation merely, preliminary to free incision for abscess or for opening up a gangrenous or bronchiectatic cavity. The trocar and cannula are used as in the operation for the re-

moval of pleural effusion; and, if the focus of disease be reached, which may be judged by the character of the discharge coming through the tube, or, in absence of this, by the foetid smell, the cannula is utilized as a guide for the knife, and a free incision made into the lung substance.

DAVID W. FINLAY.

PARALYSIS, ACUTE ASCENDING (Landry's Paralysis).—A disease characterized by motor paralysis, beginning in the lower limbs, and spreading rapidly upwards so as to involve the trunk, upper extremities and, finally, the parts innervated by the medulla oblongata.

The disease was first described by Landry in 1859.

The affected muscles retain their normal bulk, and exhibit no change in their electrical reactions. The pathological nature of the disease is obscure.

Symptoms.—Before the onset of the characteristic symptoms, slight pyrexia, pains in the back and limbs, numbness and formication of the extremities are occasionally experienced for a few days. The paralysis, with rare exceptions, begins in the lower limbs, attacking first the muscles which move the toes and ankles. In a day or two, or even in a few hours, the paralysis of the lower extremities may be absolute. While the weakness is progressing in the legs the muscles of the trunk become invaded, so that there is inability to sit up; coughing, defæcation and such-like acts become enfeebled, and respiration is embarrassed. The arms are then implicated, the weakness usually extending upwards from the hands and rapidly increasing in intensity, so that in a brief space the upper limbs may become quite motionless. Finally, the diaphragm and muscles of the neck are attacked, as well as those of the tongue, soft palate and face; deglutition becomes difficult, articulation embarrassed and dyspnœa urgent.

The paralysed muscles, though flaccid do not waste, and the electrical reactions of both muscles and nerves are unchanged. The cutaneous and tendon reflexes disappear early. Various subjective disorders of sensation are often present, but there is rarely any actual anaesthesia. The nutrition of the skin is unimpaired, there is no tendency to the formation of bed-sores, the general health is good, and the mental state is unaffected. There is frequently some difficulty in voiding the urine and fæces from

paralysis of the abdominal muscles, but paralysis of the sphincters never occurs. Pyrexia is absent, except occasionally in the initial stage, when there may be some slight fever. In exceptional cases diplopia, paralysis of accommodation and inequality of pupils have been described. An acute increase in the size of the spleen has been occasionally noted.

In a few instances the paralysis has taken a descending course, the arms or the muscles supplied from the medulla oblongata being first involved.

Course.—The majority of cases are fatal within a week, but death may be delayed for three or four weeks. In about a third of the cases recovery has been recorded, arrest taking place at any stage of the disease. Convalescence is slow, complete power often not being regained for two or three months. The parts last involved are the first to show signs of amendment.

Diagnosis.—Acute ascending paralysis has some features in common with acute anterior poliomyelitis. In the latter, however, there is rapid muscular wasting with the reaction of degeneration, and the paralysis has no progressive tendency. The normal electrical reactions and the absence of muscular atrophy in Landry's paralysis serve to distinguish it from all acute affections of the spinal anterior grey matter. In diphtheritic paralysis the soft palate and power of accommodation are first implicated, and there is loss of sensation.

Prognosis.—The danger to life is very great, even in the more chronic cases. A favourable opinion may be entertained when distinct return of power has begun to take place.

Morbid Anatomy and Pathology.—No constant or adequate changes have been discovered in the various parts of the nervous system. Slight inflammatory lesions in the grey matter of the cord and some degenerative changes in the anterior roots have been noted in a few cases, but these alterations seem to be quite exceptional. The absence of muscular wasting and the normal electrical reactions in all cases of acute ascending paralysis are against the view that the seat of the disease is in the anterior cornua. It has been suggested that this affection is due to some toxic effect. This view has lately received confirmation from an interesting case reported by Dr. Bristowe and Mr. Horsley at the Clinical Society on November 9, 1888. The facts of this case strongly suggest that acute ascend-

ing paralysis is sometimes the paralytic variety of rabies.

Ætiology.—Very little is known as to causation. The disease has been ascribed to cold, and occasionally is said to follow an acute affection, such as small-pox and typhoid fever. By some the disease has been attributed to syphilis. Males are more frequently attacked than females, and the onset occurs chiefly between the ages of twenty and forty.

Treatment.—The use of the hot or vapour bath and the application of counter-irritants along the spine have been recommended. Dr. Gowers suggests salicylate of soda, and, in addition, speaks favourably of ergotine given subcutaneously. In convalescence the constant current and tonics may prove of service.

W. B. HADDEN.

PARALYSIS AGITANS (Shaking Palsy; Parkinson's Disease).—This disease was first described by Parkinson, in 1817, with great accuracy of detail.

Symptoms.—Although tremor is the most prominent feature, and the one which has given the name to the disease, there are other symptoms which are so marked as to enable the observer to diagnose the case irrespective of the shaking, which in some cases is exceedingly slight.

In the early stages tremor usually begins in one hand, and consists in a rapid to and fro movement of the thumb and forefinger, which are moved over each other as in the act of rolling a pill; this movement is accompanied by flexion and extension of the wrist; in other cases these joints do not move, but there is a rapid pronation and supination of the forearm. The movements of the upper limb are usually followed by movements in the lower limb of the same side—the hemiplegic type—rarely of the arm or leg of the opposite side. If the disease take the usual course, after some months the other arm begins to shake, and this is followed later by movements in the other leg. Even in the early stages the hand has a characteristic attitude: the phalangeal joints are extended while the metacarpo-phalangeal joints are flexed; the thumb is applied to the forefinger and becomes hyper-extended, giving the appearance of a hand holding a pen. The movements cease during sleep, and are usually diminished or stopped by performing a voluntary movement with the hand, so much so that some cases with marked shaking can thread a needle.

One of the earliest symptoms is a

characteristic appearance of the face and carriage of the individual. There is a lack of expression about the features, and, in speaking, the lips move without the rest of the face showing any expression; there is also a characteristic fixed look about the upper part of the face; in addition, it is noticeable, in walking, that the whole body moves as one piece, and this is especially obvious when the patient turns round. It is important to note that the symptoms referable to the face and trunk are present bilaterally, when, perhaps, only one arm may be affected by tremor. The speech is already monotonous, but not as yet high-pitched. A slight stiffness at the back of the neck, which prevents the patient from looking upwards with comfort, may be complained of. The gait may not be altered, or may be somewhat slow and deliberate.

The symptoms of the early stages have been given in detail, as, when the disease is well marked, its characters are so evident that a mistake can hardly be made.

When this later stage is reached, there is tremor of all four limbs, rarely shaking of the head and tremor of the chin and tongue, the movements being synchronous. The attitude is still more characteristic: the patient stoops, the head is carried forwards, the elbows are carried away from the trunk and flexed, the wrist directed towards the ulnar border and the hand in the writing position.

The gait is typical, and consists in taking very short rapid steps; when pulled backwards till he is almost over-balanced, the patient takes short rapid steps backwards to endeavour to get behind his centre of gravity, but, as he is unable to do this, his movements get faster and faster, and he would eventually fall if not prevented; this is called "retropulsion." The same thing occurs in walking forward, but it is developed later than the backward movement. He appears now as if his whole body were solidified, and has great difficulty in rising from a chair or in looking upwards; but the movements of the eyes always escape tremor and fixity, and this the writer thinks is best shown by making the patient suddenly look to his right or left, when the eyes will turn at once, but the head follows slowly in an appreciable time after the eyes, instead of the two movements being together. The movements of the hands are slow, both in beginning an action and in performing it. The speech is monotonous and high-

pitched. In bed the patient is very restless and requires to be continually shifted into another position, and there is a great feeling of heat, so that only a slight amount of bed-covering can be borne. Although the disease is called "paralysis agitans," there is no diminution of muscular power, as tested by the dynamometer, till the latest stages. The writing is characteristic, the down-strokes being fairly well made, while the up-strokes consist of fine wavy lines. No alteration in the knee-jerks has been observed.

The duration of the initial stage is two or three years, and, when the disease is fully developed, it may last twenty or thirty years, till in the last stage when the patient is confined to his bed completely helpless, general exhaustion sets in, with mental obscurity and involuntary passing of excreta, and, with the occurrence of bed-sores, death ensues.

It must be mentioned that in rare cases all the symptoms of the disease may be developed without any tremor. The writer has now a case under his care in which for seven years all the symptoms have existed, but without any shaking in the limbs, and only in the last six months has slight tremor appeared in the chin and tongue.

Diagnosis in well-marked cases is not difficult. When the disease appears in advanced life it has to be diagnosed from senile tremors, but these begin usually in both hands simultaneously, and there are not the fixed look and the rigidity of paralysis agitans, and shaking of the head is more common in the former disease. Disseminated sclerosis is a disease of youth; the movements only come on with voluntary effort, and nystagmus is common; it cannot, therefore, be easily confounded with paralysis agitans.

Prognosis is unfavourable, although some cases improve for a time, but, when the disease is well marked, recovery can hardly be hoped for.

Pathology.—This is at present unknown, but, in the opinion of the writer, the most probable site of the lesion is the cerebrum, either in the cortex or more likely still in the basal ganglia.

Ætiology.—Paralysis agitans is a disease of middle life, usually not beginning before forty, though undoubted cases have been observed at thirty, or even younger. It affects both sexes, but men more commonly than women. As causes of the disease, mental worry and anxiety have been given, and the shaking has been observed to follow directly after some

severe mental shock. In other cases the tremors have been first observed in the hand in which a needle was evidently imbedded. Exposure to damp cold is also considered to be a cause. The onset is usually insidious, but after a sudden shock it may begin suddenly.

Treatment.—Improvement has been obtained in early cases by the use of liquor arsenicalis, cannabis indica, and morphine (Gowers); other drugs have been tried, but in most cases have failed to do any good. Galvanism has appeared to modify the tremor when applied without interruption of the current, but it has not much effect in checking the disease. Statical electricity has been tried, but without any good results. The patient should live quietly and as much as possible away from all worry and anxiety, and he should be careful to avoid all exhaustion.

C. E. BEEVOR.

PARAMETRITIS (Pelvic Cellulitis).—Inflammation of the cellular tissue about the uterus. It is also called *pelvic cellulitis*. This latter term is objected to, because cellulitis, having its origin about the uterus, may spread beyond the pelvis, and inflammation of cellular tissue in the pelvis may be unconnected with the uterus.

Parametritis arises more especially from injury to the cervix uteri and vagina. It is met with chiefly after labour. It may also follow abortion, or operations on the cervix. It is by some, and with much reason, regarded as essentially a lymphangitis due to the entrance through wounds of the cervix or vagina of phlogogenic matters which are then stopped by the lymphatic glands, and so prevented from getting further into the system. Parametritis often accompanies perimetritis, the one disease arising by extension from the other.

Symptoms.—These are much the same as those of any other inflammation in the lower abdomen, being, in brief, fever and pelvic pain. Parametritis cannot by the symptoms be distinguished from perimetritis. Taking all cases together, the pain in the early stages of parametritis is rather less than at the corresponding period of perimetritis; and gastro-intestinal disturbance, *e.g.*, vomiting, is less than in the peritoneal affection.

Signs.—These depend upon the seat of the inflammation, the stage at which it is seen, and its course. The most common form of puerperal parametritis is the inguinal. The inflammation gene-

rally begins in the cellular tissue which laterally adjoins the cervix uteri. It may remain limited to this part. If it spread further, its most usual course is to follow the round ligament to the inguinal region. The inflammation presents two stages, first that of "phlegmon," or inflammatory œdema, then that of abscess. In many cases it does not go beyond the stage of phlegmon, the disease then ending by absorption of the inflammatory exudation. In cases which terminate thus, the inflammation seldom extends beyond the pelvis and the inguinal region. In such cases we often find that while there is a swelling in one inguinal region, no exudation can be felt per vaginam. Nevertheless, the known ætiology of the disease leads to the inference that the inflammation began in the neighbourhood of the cervix, and that the products underwent absorption there before attention was directed to the inguinal swelling.

Puerperal parametritis tends to the inguinal region more often than parametritis apart from pregnancy, because at the full term of pregnancy the peritoneum leaves the uterus high up at the sides, so that there is then below it plenty of loose cellular tissue about the brim of the pelvis and the inguinal regions. Inflammation of the cellular tissue within the pelvis, and of the pelvic peritoneum, both produce a hard swelling in the pelvis. But while the induration produced by thickening of the peritoneum is bilateral, joins the uterus high up, retreats towards the sides of the pelvis out of reach of the examining finger, and dips down lowest behind, the parametric phlegmon is usually on one side only, and is in continuity with the uterus as low down as the insertion of the vagina, and thence slopes off towards the wall of the pelvic outlet. In inguinal, or as it is often called, "iliac," parametritis, there is a swelling on one side of the lower abdomen, lying close beneath the abdominal walls, feeling as if continuous with Poupart's ligament. The dimensions of this swelling present a remarkable similarity in different cases. Its upper outline is a curve starting from a little below the anterior superior iliac spine, reaching its highest level an inch or so internal to this point, where it may extend a little above it, and then descending till it sinks below the pelvic brim $\frac{1}{2}$ inch or less beyond the middle line. The inner part of this swelling is usually formed by the body of the uterus. As the absorption of the swelling progresses,

its boundaries get less defined, and its upper limit becomes lower. The swelling, after it has become definite, is hard and non-fluctuating. If it end in absorption, the patient is usually well in three or four weeks' time. There is sometimes retraction of the thigh, from the cellular tissue around the psoas muscle being affected. The course of these cases is rather longer, and in them there is generally, but not always, suppuration. When this takes place, it is marked by persistence of hectic fever, together with bulging, softening, and pointing of the swelling. In cases of suppuration with much retraction of the thigh, the pus usually extends under the psoas muscle, between it and the pelvic brim. The usual place for suppurative parametritis to burst is where the round ligament leaves the abdomen, viz., a little above the middle of Poupart's ligament. When the pus has been discharged, fever usually ceases, appetite returns and the patient's condition rapidly improves.

Course.—There are many variations in the course of suppurative parametritis. What determines these variations we do not know. Whilst, speaking generally, the abscess points and the pus is discharged as in abscesses elsewhere, there are some cases in which hectic fever persists for weeks and yet no sign of pointing appears; nevertheless, an exploratory puncture with the aspirator-needle lets out pus, the matter seeming as if bound down by some structures which prevent it coming to the surface. In other cases the abscess bulges, and appears as if about to point and burst, but after a time the swelling diminishes, and ceases to be tense, and, if opened, the matter does not flow unless forced out by pressure.

The abscess does not always follow the course of the round ligament, and burst in the inguinal region. It may pass under Poupart's ligament, and point in the thigh, or spread along the psoas muscle to the cellular tissue which surrounds the kidneys, and form a perinephritic abscess. It may extend downwards, and open by the side of the anus, or burst into the bowel, either colon or rectum; it may also creep round the uterus and involve the cellular tissue between the uterus and bladder. In this situation it may form a communication with the vagina, or the bladder, or it may follow the urachus and present at the umbilicus or at some point in the middle line between the pubes and umbilicus. Again, the pus may travel backwards through the sacro-sciatic notch,

and open by the side of the sacrum. It may follow the obturator tendon to the thigh, and come to the surface near the trochanter. In three cases seen by the writer the cellular tissue between the bladder and the symphysis pubis was affected. There may be more than one abscess, or the same abscess may open, in more than one place. Even after the abscess has been opened by the surgeon another opening may be formed spontaneously elsewhere. An abscess may open into the bowel as well as externally, and fæces or intestinal gases escape into the abscess cavity. Usually, however, although pus flows from the abscess into the bowel, fæces do not pass into the abscess cavity. As a rule, the communication with the bowel soon closes spontaneously, or, at least, the passage of gas and fæces into the abscess does not continue long. In the formation of a pelvic abscess, vessels of some size may be opened and hæmorrhage take place, and such hæmorrhage may be fatal.

Prognosis.—This is, as a rule, favourable. It differs from the prognosis in perimetritis in this, that there is not in parametritis a tendency to relapse. If the inflammation end in absorption, the patient soon gets well, and remains well. If suppuration take place, the patient remains very ill, with hectic fever, wasting, &c., until the abscess bursts, and then, as a rule, rapid amendment follows. The patient may die from hæmorrhage, or from exhaustion from the long discharging of a sinus, or from some other disease brought about by the long-continued suppuration; but this is rare.

Treatment.—There is no drug that will certainly produce absorption or prevent suppuration. While there is any pyrexia, the patient should be kept in bed; appetite should be helped by tonic medicines, and the strength maintained and nutrition favoured by easily digested food. To aid absorption and lessen inflammation, the skin of the abdomen may be painted with lin. iodi. Sedative local applications may be used, if necessary, to relieve pain. When suppuration has occurred, if the patient be free from pain, the abscess may be allowed to burst. But if there be much pain, it is better to open the abscess by a free incision, and insert a drainage-tube. In some cases, especially those in which the suppuration extends under the psoas muscle, it may be that the abscess will not heal until the parts are kept at absolute rest by fixing the limb, which can be done by enveloping the pelvis and the thigh on

the affected side in a plaster-of-Paris case.

Erysipelas Malignum Internum, so-called (Virchow).—The inflammation of cellular tissue that has so far been spoken of may be described as "sub-acute." After delivery there is sometimes seen an acute, suppurative, rapidly spreading inflammation of cellular tissue, beginning in the pelvis, and resembling the so-called "phlegmonous erysipelas" which is seen in the subcutaneous cellular tissue. It is this disease which Virchow has described as one form of puerperal fever, and to which he has applied the name "erysipelas malignum internum" (thereby causing his authority to be adduced in support of the view that there is identity between cutaneous erysipelas and puerperal fever). This disease differs widely from erysipelas of the skin. It is usually rapidly fatal, and is generally associated with an unhealthy condition of wounds of the genital passage received in parturition, and with general pyæmia. It is to be prevented by the use of antiseptics at the time of delivery.

Cases have been recorded of a rare form of cellulitis dependent upon sloughing of the cellular tissue in the pelvis, like that which occurs when urine is extravasated, but occurring without any injury or disease of the urinary organs. It is usually fatal, but may take a chronic course and end in recovery. A similar disease has been observed in the scrotum of the male. Nothing is known about its ætiology or pathology. The treatment is to open the abscesses and let out the sloughs.

G. E. HERMAN.

PARAPLEGIA.—The term "paraplegia" was formerly applied to all forms of paralysis of spinal origin, and also to those which are now known to depend on disease of the peripheral nerves. With the advance of our knowledge the use of the word has become more restricted, until at the present time the term is chiefly employed to denote those spinal affections the pathological nature of which cannot be definitely determined during life. The number of such affections is still considerable, for it is a matter of great, often insuperable, difficulty to forecast during life the exact anatomical conditions of a spinal paralysis. But, although a precise pathological diagnosis is often impossible, it is usually justifiable to ascribe certain clinical states to lesion of well-defined parts of the spinal cord. An acute paralysis (provided this be clearly not

due to affection of a definite nerve) accompanied by marked wasting of the muscles, with qualitative change in the electrical reactions, without impairment of sensation and without implication of the bladder and rectum, may be referred with confidence to disease of the anterior grey matter of the cord, or, more definitely, to the large multipolar cells.

Again, a slow paraplegia, with rigidity of the muscles and exaggeration of the tendon reflexes, is due to degeneration of the lateral columns, or rather of the pyramidal tracts which occupy the main part of these columns. Spasmodic paraplegia is a convenient clinical term for such a condition, and lateral sclerosis is commonly used to denote its anatomical cause.

It may, however, be observed, parenthetically, that a spasmodic paraplegia practically undistinguishable from that found in organic disease of the cord may be present in such conditions as hysteria, and may even result from prolonged over-use of the muscles, and that under such circumstances there is reason to believe that there is no coarse disease of the spinal cord. In most instances there is no doubt that spasmodic paraplegia is accompanied by degeneration of the lateral columns, but the difficulty is to determine on what such a degeneration depends. This is a matter of the greatest importance, for prognosis and treatment will be alike influenced by a knowledge of the underlying pathological conditions. Is the spasmodic paraplegia due to secondary degeneration in the lateral columns from the pressure on the cord of a tumour or aneurysm or of inflammatory products (as in Pott's disease), or to a localized patch of softening? Or, again, is it part of a diffuse change in the nervous centres, such as is present in disseminated sclerosis, general paralysis of the insane and amyotrophic lateral sclerosis? Finally, is the clinical condition to be ascribed to a primary degeneration of the pyramidal tracts? Such are the problems which present themselves, and it must be allowed that not unfrequently the true nature of the affection remains undecided. To denote a clinical state, the term spasmodic paraplegia, may, therefore, be justifiably employed, but the various underlying pathological causes should be borne in mind.

Another form of paraplegia is characterized by loss of motor power with flaccidity and diffuse wasting of the muscles and qualitative changes in their electrical reactions, absence of the re-

flexes, together with loss of sensation, want of control over the sphincters of the bladder and rectum, and a tendency to the rapid formation of bed-sores. Such a condition may occur suddenly as a primary affection, or may supervene acutely in various chronic affections of the cord. As a primary state, a paralysis with these characters is usually ascribed to acute myelitis (often loosely termed "softening"); but here again there is a divergence of opinion as to the true nature of the morbid change. That there is a destructive alteration of the grey matter of the cord is undoubted, but it is by no means clear whether this depends on primary inflammation, or on degenerative processes, or on initial vascular changes such as thrombosis, or, lastly, on the presence of some infective agency.

Disease of the posterior columns of the cord, or, more precisely, of the external part of those columns or the posterior-root zones, gives rise to the condition now known under the name of locomotor ataxy or tabes dorsalis. In this affection motor power is retained, but there is inability to co-ordinate the voluntary muscles. It is not necessary to recapitulate here the chief points in the symptomatology of this disease, as a full account of the condition and of its diagnostic features is given elsewhere. Under the heading of "Paraplegia" it is convenient to describe here two forms of paralysis. The first is characterized by combined inco-ordination and weakness, and is known under the name of "ataxic paraplegia." The second, which embraces several clinical types, although having a similar causation and anatomical nature, has been described under various terms, such as "birth palsy," "infantile spasmodic paralysis," "bilateral spastic hemiplegia," and "spastic diplegia."

Ataxic Paraplegia.—This disease, which is slowly progressive, is marked by the co-existence of weakness and inco-ordination, affecting first, and sometimes exclusively, the lower limbs. In the early period the ataxy is the predominant feature, and the unsteadiness and irregular gait are such as are seen in ordinary tabes dorsalis. Even in the early stage exaggeration of the knee-jerk and the presence of clonus mark off the affection from tabes, in which the knee-jerk is lost from the beginning.

With the progress of the disease the lower limbs slowly become weaker, rigidity supervenes, and a condition of

spasmodic paraplegia with some degree of inco-ordination is established. The arms may suffer in the same way as the legs, but sometimes they remain unaffected. It is important to bear in mind, as distinguishing points from tabes, that lightning pains are of the rarest occurrence, that anaesthesia and hyperaesthesia are almost invariably absent, and that throughout the disease there is marked increase in the tendon reactions, and very commonly clonus may be elicited. The pupils, with rare exceptions, are normal; atrophy of the optic nerves is much less common than in tabes; and the external ocular muscles are generally unaffected. Girdle-pains are uncommon; but Dr. Gowers calls attention to a dull pain in the spine, frequently in the sacral region, which is often an early symptom.

The plantar reflexes are normal or increased. Sexual power may disappear early, and there is often loss of control over the bladder and rectum, though usually this is not extreme. Impaired articulation, with irregular movements of the face, is sometimes present, and this may be associated with mental change and sometimes with general paralysis of the insane. It is important to note that cases occur which seem to constitute a link between tabes dorsalis and the typical ataxic paraplegia.

Diagnosis.—The points of distinction between this disease, tabes dorsalis and spasmodic paraplegia are evident from the foregoing description. Ataxic paraplegia resembles in many respects the hereditary ataxy of Friedreich. The main points of difference are the usual occurrence of the latter in members of the same family, the fact that the knee-jerk is commonly absent in hereditary ataxy, and that nystagmus and affection of speech are frequent. From cerebellar disease ataxic paraplegia is distinguished by the absence of headache, vomiting and optic neuritis.

Morbid Anatomy.—Both posterior and lateral columns are the seat of sclerosis. According to Dr. Gowers, the change in the posterior columns differs from that found in tabes in two respects—(1) the degeneration is usually not more marked in the lumbar region than elsewhere, and (2) the posterior-root zones are not especially affected. The sclerosis in the lateral columns is generally diffuse and more or less irregular; occasionally there is annular sclerosis, which extends into the substance of the cord in the region of the lateral columns.

Ætiology.—The causation is obscure. Dr. Gowers asserts that "a history of syphilis is as rare as it is frequent in pure tabes." Males are attacked in much larger proportion than females. The period of greatest liability is between thirty and forty. Exposure to cold, injury to the spine and sexual excesses are mentioned as antecedents.

Treatment.—Turkish baths and rubbing of the affected limbs are said to be of service. The effect of drugs is doubtful. The method of suspension (described under LOCOMOTOR ATAXY) deserves a trial.

Infantile Spasmodic Paraplegia (*Spastic Cerebral Paraplegia; Spasmodic Tabes Dorsalis; Birth Palsy*).—In this affection there is muscular rigidity of the lower limbs, usually noticed at birth or shortly after. The thighs are rigidly adducted and slightly flexed at the hips, the knees are in contact and often overlap, the heels are drawn up by the contraction of the calf-muscles, and the feet are in a position of talipes equinus or equino-varus. If progression be possible, the patient will be seen to walk on the toes, and as one or the other limb is brought forward the knees rub together and overlap. The gait is characteristic, and is known under the name of "cross-legged progression." The tendon reactions are exaggerated, but clonus is not usually to be elicited. The muscles do not undergo degenerative atrophy, and there is no change in the electrical reactions. Sensation is intact. The sphincters of the bladder and rectum are unaffected, except in cases where there is marked mental impairment. This condition of spasmodic paraplegia, which is believed by most authorities to have a primarily cerebral origin, may exist alone, though not uncommonly other symptoms are present which point to more widespread change in the brain. Some degree of awkwardness or ataxy of the hands may be evident, or there may be rigidity of the upper limbs, sometimes slight, sometimes extreme. In the latter case the arms are stiff and flexed at the various joints. When both arms and legs are affected the condition is sometimes termed "bilateral spastic hemiplegia of children," or "spastic diplegia." Sometimes there are irregular movements, most commonly affecting the upper limbs, which resemble chorea or athetosis, and hence such cases have been described under the terms "chorea spastica" and "double congenital athetosis." Irregular movements occasionally

affect the face and tongue. In some instances the paraplegic rigidity of the lower limbs is associated with rigidity of one upper extremity. Weakness of the muscles of the neck and trunk is often present, so that the child is unable to sit upright or to maintain the head in position. When the lower limbs only are affected, speech may be unimpaired; but sometimes articulation is defective, and occasionally there is total inability to talk. Mental impairment, ranging from mere dullness to marked idiocy, may be present. Extreme defects of speech and great mental impairment are most commonly present when the upper limbs are markedly affected. Convulsive attacks, which often occur immediately after birth, may persist. Among other occasional conditions, nystagmus, squint, inequality of pupils, retarded dentition, defective teeth, arching of the palate, asymmetry of the head and microcephalus may be noted.

In most cases of the conditions just described there is a history of convulsions and asphyxia at birth, and, as will be presently shown, there is reason to believe that in the majority the affection is due to damage to the brain during parturition.

Diagnosis.—When rigidity of the limbs is noticed at birth, or soon after, there can be no doubt as to the real nature of the condition. It often happens, however, that the state of the limbs does not attract attention for months, sometimes not until the period when the child should begin to walk. In a small proportion of birth palsies the condition is unilateral, and then the affection may be confounded with ordinary infantile hemiplegia. An important distinguishing point is the occurrence of an acute onset in the latter, whereas the former will be noticed at birth or very shortly after, or, when the condition does not attract notice until a later period, there is no history of an abrupt supervention of the hemiplegia.

Morbid Anatomy.—In the recorded fatal cases of bilateral spastic hemiplegia there has been found sclerosis with atrophy of the motor convolutions or a simple arrest of development, and occasionally a condition of porencephalus. It is supposed that the cortical sclerosis found in many of these cases is due to hæmorrhage into the meninges and superficial parts of the brain from prolonged pressure on the foetal head during childbirth. If the child survives, the meningeal extravasation becomes ab-

sorbed, but the cortex, which has been damaged partly by compression, partly by extravasation of blood into its substance, undergoes degenerative changes. The information regarding those cases in which the lower limbs are mainly or exclusively affected is less definite. There is reason to believe, however, that the condition is due to the causes already mentioned. The pyramidal tracts in the spinal cord have occasionally been found sclerosed, and in some instances undeveloped. It is not improbable that some cases of birth palsy are due to arrest of development, and some possibly to disease in foetal life.

Etiology.—A large proportion occurs among the first-born, and in most there is a history of prolonged labour or unnatural presentation, with convulsions and asphyxia at birth. In a few instances there is a history of premature labour.

Prognosis and Treatment.—Fortunately, there is a tendency to improvement in many of these cases of spasmodic paralysis. As voluntary control is acquired, some power of standing and of walking may be slowly gained. The prognosis is unfavourable when the arms are much affected and when there is great mental impairment. Prolonged massage of the limbs, gymnastics and education should be employed. The ordinary go-cart is a useful agent. Sometimes division of tendons and muscles is attended with benefit, but very often the result is disappointing. Drugs, except in the case of persistent convulsive attacks, and the use of electricity are without service.

W. B. HADDEN.

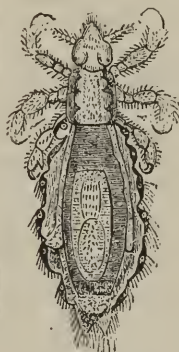
PEDICULOSIS (Phthiriasis; Lousiness).—Three kinds of lice prey upon the human skin, causing dermatitis of the regions they inhabit. The diseases thus produced are essentially confined to the neglected and uncleanly, are limited to the parts protected by clothing or by hair, and are usually proportional in severity to the number of the parasites present, although debilitated persons and those at either extremity of life are prone to suffer most severely.

Pediculus Capitis.—The insect is greyish in colour, but in dark races acquires a dark, even black, hue; it is smaller than either *P. corporis* or *P. pubis*. The male is smaller than the female (Fig. 1); it presents a head, thorax and abdomen. The head is triangular, carries a pair of jointed antennæ, minute, compound, lateral eyes, and a complicated masticatory apparatus. The body has

brownish markings on the sides; the thorax is narrow, carrying three pairs of jointed legs terminating in a claw; the abdomen is long and has seven segments, the last of which is rounded off. The penis projects from the dorsal surface, on which is also situated the anal aperture. The female exists in much greater abundance than the male; the last dorsal segment is forked; the genital opening is on the ventral surface. They are oviparous, and lay from fifty to sixty eggs, from which the young emerge after six days, and in

FIG. 2.

FIG. 1.



Female *Pediculus*
Capitis.



Hair with Nits of
Pediculus Capitis.

twenty-seven days become sexually mature.

The ova, or nits (Fig. 2), are often present in abundance when the mature insect can only be detected with difficulty; they are most commonly found in the occipital region, and appear as white specks attached to one side of the hair-shaft, to which they are pretty firmly adherent by means of a chitinous cement substance which surrounds the hair like a tube, so that they can usually be moved with the finger along the hair; this serves to distinguish nits from loose scales. Each ovum has a lid or operculum.

Pediculus capitis in healthy persons may cause no symptoms except slight and occasional itching; indeed, the discovery of their presence is often accidental. When they are very numerous, however, and occur in cachectic persons, or in children with irritable skins and a predisposition to eczema, intensely severe weeping, pustular dermatitis may be produced as the conjoint result of the parasite and of scratching. Ulceration occurs, thick crusts and scabs form, the hairs

become matted together by gummy discharge entangling epithelium, dirt, lice and débris, constituting the condition formerly described as *plica polonica*, from its frequency among the Jewish inhabitants of Poland. The corresponding cervical lymphatic glands are almost always swollen, often suppurate and may form large abscesses. The glandular affection more frequently attracts the attention of parents than the primary cause. The pus has a special tendency to acquire infective properties, impetigo supervenes and sores appear on the face, hands and other parts of the body.

The disease is commonest in children and in young women with abundant and knotty hair.

Treatment is promptly successful, but re-infection is, for obvious reasons, very common. In children the nits are best removed by cutting the hair very short; crusts are best removed by soaking with oil and under white precipitate ointment (diluted, if necessary) the sores rapidly heal. In adults, the nits may be loosened by soaking the hair in turpentine or kerosene for twenty-four or thirty-six hours, the head being covered with a flannel mask, and then removed by frequent washing and assiduous use of a fine comb. In less severe cases nits may be destroyed by lotions of carbolic acid (1-40) or perchloride of mercury (gr. iij ad ℥viiij). After crusts have been removed, as already described, white precipitate ointment applied to the ulcerated surfaces will soon complete the cure.

Pediculus Corporis (vel vestimentorum).—*Pediculus corporis* (Fig. 3) closely resembles *pediculus capitis*, but is slightly



Male *Pediculus Corporis*.

larger, and the head is more elongated; the abdomen has eight segments, and is distinctly separated from the thorax; the antennæ, legs and claws are more developed, and its movements are much more rapid. It is greyish-white in colour, and lives entirely in the clothing, especially in the folds, only resorting to the skin for nutriment. It is possessed of a labium surrounded by a collar of hooklets which it fixes into the margin of the opening of a cutaneous—generally a sweat-gland; then it protrudes its membranous proboscis or sucking ap-

paratus into the skin and sucks up blood, at the same time causing a minute, evanescent wheal; when the proboscis is withdrawn a little blood fills the dilated follicle and coagulates to constitute the pathognomonic "hæmorrhagic speck," which may be differentiated from excoriations produced by scratching secondary pruriginous papules by its smaller size, and by not being raised above the general level of the skin. These specks are most common about the neck, shoulders and clavicular regions, then about the back, thighs, and abdomen, but the secondary lesions produced by scratching generally greatly predominate and comprise wheals in parallel lines, linear excoriations, torn papules with adherent blood clots, pustules, scabs and ecthymatous sores. In old-standing cases the skin becomes harsh, deeply pigmented, hardened and thickened (*morbus erroneum, vagabond's disease*) and the lymphatic glands enlarge. The subjective symptoms are burning, itching and creeping sensations, always worst at night, and transferred, probably by cutaneous reflexes, to other regions than those where the real origin of the disease is located.

The disease is distinctly rare in early life, but very common in advanced life, especially in the dirty and cachectic.

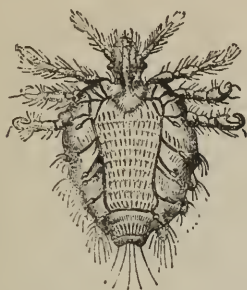
Diagnosis.—The distribution distinguishes it from scabies; the history, age of the patient, hæmorrhagic specks, and presence of pediculi or their ova on the body or in the folds of the clothing, especially of the neck-band, diagnose it from prurigo.

Treatment must be directed chiefly towards the clothing, which ought to be subjected to a dry heat of at least 220° F. for several hours, preferably in a disinfecting oven. It is well to iron all underclothing along the seams. Stavesacre ointment freely applied destroys all pediculi that may remain on the skin, and subsequent pruritus may be relieved by a lotion of liquor carbonis detergens (℥j ad ℥viiij). Good feeding and constituents, especially cod-liver oil, are of value.

Pediculus Pubis (Phthirus Inguinis; Crab-louse) resembles *P. capitis*, but is shorter, broader, and flatter (Fig. 4); the head is rounder, and has five antennæ; the thorax and abdomen are not separated by a constriction. The two posterior pairs of legs with their claws are stronger. The female lays from ten to fifteen eggs, from which the young emerge in six days, and are sexually mature in four-

teen days. The head-quarters of the parasite are in the pubic hair, where they penetrate into the hair follicles, the

FIG. 4.



Male *Pediculus Pubis*.

nits being fixed to the base of the hair-shaft. Thence they may emigrate to the hairs along the middle line of the abdomen, to the sternal region, axillæ, eyebrows, eyelashes, and beard, but almost never to the scalp. Their salivary secretion inoculated beneath the skin produces extensive bluish discoloration (*maculæ ceruleæ, taches ombrées*).

P. pubis causes itching, varying much in severity in different subjects, but always worst at night, and the consequent scratching produces a localized dermatitis similar to that described under *P. corporis*. The parasite, from its small size and close attachment to the skin, is often difficult of detection, but must always be carefully searched for in cases of eczematous rashes in the pubic region. The disease is by no means confined to the dirty or to the lower classes of society.

Treatment.—Free inunction of unguentum hydrargyri is always promptly effectual, but may cause dermatitis. Chloroform vapour, white precipitate, naphthol or stavesacre ointment are almost equally efficacious and less objectionable. It is not necessary to shave or cut the hair short. Pruritus subsequent to cure is common, and may be relieved by lotions of calamine or liquor carbonis detergens (3j ad 3vj).

Cimex Lectularius (*Acanthia Lectularia*; *Common Bed-bug*) is oval in shape and of a brown colour. The head carries a long proboscis, two jointed antennæ, and a pair of eyes; the thorax carries three pairs of three jointed legs; the abdomen consists of eight segments. The peculiarly offensive odour of the insect is due to the secretion of a gland situated on the anterior part of the meta-

thorax. The female deposits numerous operculated ova in the early spring; in three months a larva is produced, similar in every respect to the parent except in size; this becomes full-grown in three weeks. The bed-bug is nocturnal in its habits, and lives in the cracks of wood, &c. It is able to undergo long periods of inanition, and possesses remarkable olfactory powers.

Cimex attacks for preference the hands, feet, and face, causing urticarial wheals with a central puncture, which, by scratching, may be converted into papules or even pustules. The irritation which they produce is attributed to the deposition of an acrid matter in the wound which excites hyperæmia and renders the blood more accessible to the parasite.

Treatment.—Washing with Eau de Cologne or a mild carbolic or naphthol lotion relieves all symptoms. Sulphur fumigations effectually destroy the insect.

Leptus Autumnalis (*Harvest Bug*) is a comprehensive term applied to a sexual parasite larvæ of different species of the family Trombidinæ, genus Arachnidæ. They are minute, oval in shape, reddish in colour, and possess eight jointed legs, arms with hooklets, as well as a formidable rostrum. They frequent the fields, especially in autumn, and are also found on gooseberry and currant bushes, in granaries and barns. The animalcule implants its rostrum into the opening of a sebaceous gland at the base of a hair-shaft while the hooklets of the legs act as anchors. Intense irritation is set up, with the formation of urticarial wheals and minute papules; frequently the other phenomena due to severe scratching are developed. The legs, being nearest the ground and most accessible, are the parts most frequently attacked, but occasionally the whole body may participate, and considerable general disturbance ensue.

Treatment.—Diluted sulphur or naphthol ointment or weak corrosive sublimate lotion rapidly effect cure and destroy the parasite.

Pulex Irritans (*Common Flea*) is a temporary parasite, and only attacks man in the later stages of its development. It is of deep brown or black colour, and is highly active; it possesses a head bearing antennæ, eyes, and a complicated suckorial boring apparatus, a thorax bearing three pairs of powerful legs adapted to jumping, and an abdomen with nine segments. The female is about twice as large as the male; she

usually lays about twelve eggs in clothing, the cracks of wood-work, &c. These are broad, flattened at each end, and present several micropyles. In about six days a white, footless, eyeless larva with thirteen segments is developed. It feeds on organic matter and the faeces of the parent, and in eleven days forms a cocoon consisting of fine fibres of a sticky material and foreign matters. From the cocoon springs a whitish-yellow larva, similar in shape to the adult; this reaches maturity in eleven days. The average development to the adult parasitic stage occupies about twenty-eight days in summer and about forty days in winter.

Pulex produces a minute circular red spot, in the centre of which is a tiny speck which marks the spot where the boring apparatus has penetrated the skin. The actual "bite" of the creature is sometimes accompanied by a smarting sensation, and examination reveals the parasite in the very act. Some persons are habitually insensible of, and ignore, the bite and its consequences; others suffer severely, the irritation causing diffuse eczematous eruptions and sometimes even fever. Any part of the body may be attacked, but usually the face and hands escape. The flea is distributed all over the world, and apparently the only inaccessible regions are the deserts; it is especially associated with personal and domestic uncleanness.

Treatment.—The use of Goulard's extract, weak carbolic, or calamine lotion soon relieves the itching.

Dracontiasis (*Guinea Worm Disease*) is a disease of the skin, characterized by the development of deep vesicles or abscesses, due to the presence of the fully developed nematode worm, *dracunculus medinensis*.

The female worm is cylindrical, $\frac{1}{10}$ th inch in diameter and generally about 30 inches long, although occasionally much longer. The mouth is surrounded by four papillæ; it is viviparous and contains an enormous number of embryos which, escaping from man into water, lodge in a minute crustacean—cyclops—where they grow to full maturity in six weeks. They obtain entrance accidentally into the human interior, where they become impregnated, and the female passes through the tissues to lodge in the skin, generally about twelve months after they obtained entrance into the system. The characters of the male are not known; they are sup-

posed to be excreted along with the faeces. The idea formerly entertained that the worm enters the skin of the feet or legs during bathing is undoubtedly erroneous.

In the great majority of cases the worm is single and is detected in the foot, leg or thigh, where it can be felt like a bundle of soft string under the skin. When about to make its escape it gives rise to some itching and discomfort; then a small abscess-like swelling forms from which clear fluid is discharged and in which the head of the worm can be detected. In some cases very severe inflammation and suppuration may occur along the whole worm-track, with fever and much constitutional disturbance. If the worm break during extraction the embryos may penetrate into the system and cause disastrous results. The disease is endemic in India, Arabia, Mauritius, Egypt, the Gold Coast, and Guinea, and occasionally is observed in the West Indies and Brazil.

Treatment must be mainly directed towards the removal of the worm entire. The abscess cavity having been opened, very gentle traction must be made on the head of the worm and as much as can be easily extracted wound round a small stick, to which a turn or two can be given daily till the whole is extracted. Abscesses must be treated on general surgical principles.

J. J. PRINGLE.

PELIOSIS RHEUMATICA (*Purpura Rheumatica*).—A condition much more closely related to erythema exudativum than to the forms of purpura, along with which it is usually classified. It resembles the former disease as regards distribution, concomitant symptoms, tendency to relapse and to hæmorrhage, which latter is usually so marked a feature as to mask its truly erythematous nature.

The lesions are at first slightly elevated papules, from the size of a pin's head to a lentil, of a deep red colour which does not disappear on pressure and soon becomes dark purple, subsequently undergoing the changes of tint common to all blood extravasations. They are always present on the legs and feet, often clustered round painful joints, and are also common on the hands and arms, but very rare on the trunk and face. The hæmorrhagic papules may be confined to the immediate vicinity of the follicles and remain discrete, or may coalesce to form extensive, irregularly shaped patches,

round the margin of which isolated hæmorrhagic spots can generally be observed. Sometimes erythematous or urticarial rashes (*P. urticans*) are present on other parts of the body, and, more rarely, vesication occurs (*P. pemphigoides*).

Peliosis is commonest in persons from fifteen to thirty years of age, especially perhaps of the male sex. An outbreak is preceded by, or attended with, considerable lassitude, malaise and feverish disturbance, which frequently subside when the rash is fully developed. Rheumatic pains, effusion into joints, especially the knees and ankles, and œdema of the feet usually accompany it, and sometimes acid sweats occur, while endocarditis may develop during its progress. In severe cases hæmaturia has been noted. Repeated relapses of all the symptoms of the original attack almost invariably occur, prolonging the disease over several weeks, and there is a marked tendency to recurrence at regular intervals.

The disease must be considered as closely allied to articular rheumatism. The immediate cause of the rupture of capillaries and consequent hæmorrhage is unknown. The blood infiltrates the papillæ or deeper layers of the corium especially round the glands and hair follicles.

Diagnosis.—The affection must be carefully differentiated from symptomatic and idiopathic purpura, from flea-bites, hæmorrhagic syphilodermata, and hæmorrhagic iodide or bromide rash.

Treatment certainly influences the course of the disease. Absolute rest must be enjoined. The diet ought at first to be chiefly liquid with slops, but in old-standing cases more liberal and stimulating fare may be indicated, including fresh vegetables, butcher's meat and wine. Salicylates are very efficacious in relieving pain and joint symptoms. Small doses of turpentine internally and ergotin subcutaneously control the hæmorrhagic tendency, while the astringent salts of iron, especially the perchloride, arsenic and quinine are all of value.

J. J. PRINGLE.

PELLAGRA.—An endemic disease confined to the south of France, the north of Spain, the north and centre of Italy, but occasionally observed in Roumania. As its effects are most marked on the skin, especially in its earlier manifestations, it may be here considered as a "skin disease," but the central nervous and digestive systems are also profoundly

affected and its fatal issue is due to their involvement.

Pellagra is found only among the most destitute and squalid of the peasantry, and is invariably due to chronic poisoning with diseased or fermented maize, the effects of which are in many respects analogous to those induced by ergot of rye. Children are rarely affected, and women suffer more frequently than men. Attacks are especially frequent between the ages of thirty and fifty years.

The disease always begins in spring, and is preceded by or ushered in with gastro-intestinal symptoms (coated or red tongue, nausea, vomiting, epigastric tenderness, diarrhoea, &c.), resulting in great weakness, lassitude and emaciation; giddiness, various neuralgiæ and "rheumatic" pains in the limbs are also frequent prominent complaints. The portions of skin exposed to the air and light (face, neck, backs of hands and feet) become the seats of an intense, rapidly extending erythema, bright red, livid or brown in colour, with much swelling, and causing violent burning or itching. The spreading edge of the patches is much elevated and generally of deeper colour than the central portions.

In the first attack the symptoms usually subside after about three months; the skin occasionally suppurates and discharges, but more frequently cracks or merely desquamates, and recovery, apparently perfect, occurs spontaneously. Unless the patient, however, leave the district, the symptoms recur with ever-increasing intensity in each succeeding year, the rash extends over the whole body, the skin becomes completely anæsthetic and the patient succumbs in the course of a few years, in a condition of extreme marasmus. Mental disorders, especially acute mania and melancholia with suicidal tendencies very often precede the fatal termination.

Pathology.—Nothing very definite or distinctive is known of the pathology of the disease, but it is surmised—and with much probable truth—that it is due to the toxic effect on the sympathetic and pneumogastric nerves of a fatty oil and extractive matter found in decomposed and fermented maize.

Neuritis of cutaneous nerves has been demonstrated, and fatty degeneration, atrophy and peculiar deep pigmentation of almost all the internal organs is usually found.

Treatment.—No treatment is of avail unless the patient be removed from the locality and placed in good hygienic sur-

roundings. Maize as an article of diet is, of course, to be interdicted. Arsenic is said to have a powerful controlling effect over the disease, and general tonic measures and drugs are to be recommended.

To prevent the occurrence of the disease in pellagrous districts, the maize ought to be garnered in warm, dry and well-ventilated granaries.

J. J. PRINGLE.

PEMPHIGUS (*Pompholyx*; **Bladder Tetter**)—A disease of indefinite duration, characterized by the development of successive crops of blebs or bullæ on the skin, and more rarely on the mucous membranes.

It is so closely allied to the group of morbid conditions described as hydroa, and through it to the vesicating forms of multiform erythema, that no absolute line of demarcation, either clinical or pathological, can be drawn between them, the same case being frequently relegated by several equally competent observers to different categories. Nevertheless, the majority present the comparatively definite characters now to be described.

Acute Pemphigus is so rare a disease in adults, as to merit but short notice here. Its onset is preceded and accompanied by high fever and symptoms of severe nervous prostration; bullæ develop rapidly and indiscriminately over any part of the body, dry up, or burst, forming scales or crusts, and spontaneous recovery ensues in a few days, or rapid death with involvement of the mucous surfaces.

In cases of so-called **Pemphigus Solitarius**, the blebs are single or few in number, localized in distribution, and accompanied by little constitutional disturbance. Some doubt has been cast upon the existence of the disease as an "entity," and probably the majority of cases described are really examples of impetigo, or the "ecthyma" of older authors. The writer has, however, seen one case in an old man suffering from universal leucoderma with severe pruritus, in which the eruption of two large blebs on the feet—undoubtedly spontaneous—was accompanied by high fever, "typhoid" symptoms, and diarrhoea, resulting in death in four days. There was no autopsy.

Acute pemphigus occurring in children newly born (*P. Neonatorum*) is much less rare; it occurs epidemically or sporadically, is always generated in unsani-

tary dwellings, being of undoubted septic origin; it is infectious, and may extend to adults occasionally. Children affected may be otherwise healthy; an acute eruption of blebs resembling those of pemphigus vulgaris, accompanied by severe febrile disturbance, occurs on any part of the body except the soles and palms. A certain proportion of cases recover with careful treatment and nursing, but the large majority succumb at the end of two or three weeks. The disease must not be confounded with bullous syphiloderma, which occur at the same age, but invariably attack the palms and soles, and are associated with other evidences of congenital syphilis.

Chronic Pemphigus (*P. vulgaris*) is also a comparatively rare disease, but one of extreme interest. It more frequently attacks children than adults, but authorities differ as to its relative frequency in the sexes; probably both suffer about equally often. It is sometimes hereditary, and may affect several members of the same family.

The eruption may occur on any part of the body except the palms and soles, its seats of election being the abdomen, chest and thighs, the face, ears and neck, the genitals and the backs of the hands and feet. The lesions are always bilateral, sometimes grouped, sometimes roughly symmetrical, but usually remarkably indiscriminate in distribution. Occasionally an antecedent polymorphous erythema of varying duration may be present, but in typical cases the erythema is either absent or of extremely short duration, and an eruption of large bullæ testifies to the onset of the disease. These bullæ are hemispherical, tense, and rapidly increase peripherically, or coalesce to form blisters the size of a marble or walnut, or even larger. They may have a surrounding arcola of congestion, but its presence is atypical. Their contents are at first clear, but soon become turbid, flaky, and purulent; hæmorrhage often occurs into them in the severer forms; soon they dry up, forming crusts, or burst and discharge, forming thick scabs, the separation of which—after a variable time—leaves deep purplish stains, which become brownish and ultimately slowly disappear without leaving scars. The appearance of successive crops of fresh lesions—it may be daily (*P. diutinus*)—is very characteristic, and explains the coetaneous existence of lesions of different ages—e.g., erythema, blebs, ulcerations, scabs, pigmentation. After recovery, universal desquamation

generally takes place, even from areas unaffected by the disease—*e.g.*, palms, soles. The duration of the disease is indefinite; it may last weeks or months, or may run on for years with periodic aggravations. Even after apparently complete recovery, the tendency to relapse after varying intervals is very marked, and eminently dispiriting.

The *constitutional symptoms* are often surprisingly trivial, but in some cases, especially in old persons and children, each outbreak is preceded by rigors and fevers, sometimes with delirium. The amount of itching, burning and tension is very variable, but occasionally these subjective symptoms are intense (*P. pruriginosus*), and in great part account for the sleeplessness, which is often one of the most troublesome complaints, and undoubtedly plays an important rôle in the production of the extreme exhaustion, which results in death.

The most rapidly fatal cases, however, are those in which the mucous membranes are attacked; in them, as in allied diseases of mucous membranes, bleb-formation is not distinct, or is of very ephemeral existence, owing to rapid maceration and removal of the wall of the bleb; early ulceration thus occurs, and results in the production of diphtheritic-looking lesions. The mouth is generally first affected, the tongue swells, the breath is fetid, salivation is copious, and dysphagia ensues from involvement of the œsophagus. The vagina is often affected in like manner. Diarrhœa results from a similar condition in the large intestine, and the occurrence of pneumonia and nephritis, which may supervene, is probably due to an analogous process. In such cases a lethal termination is almost invariable, and generally after a short duration of the disease.

Pemphigus affecting the conjunctiva presents some special features; occasionally it occurs either long previously to, or independently of, skin lesions, the conjunctivæ undergoing a process of so-called "essential shrinking," which results in thickening and opacity of the cornea, and finally in atrophic destruction of the eyeball.

In the extremely rare form of the disease termed *P. Vegetans*, the bullæ on the mucous membranes precede those on the skin by days, and even weeks. They arise most frequently in the axillæ, or groins, and on the backs of the hands and feet. After rupture, they leave ex-

tensive excoriations, which have little or no tendency to heal, but ulcerate deeply and fungate, discharging offensive, viscid fluid. Recovery may occasionally take place, but multiple epitheliomatous growths are very apt to arise from the lesions, the patient dying from profound cachexia.

Pemphigus Foliaceus is another rare form of the disease, very dissimilar at first sight to *P. vulgaris*, but it has been observed to result from repeated attacks of the latter. The bullæ are small, never quite filled with fluid, and, therefore, flaccid and flat; they come in rapid crops, and so soon burst at the periphery that careful observation is often necessary to verify their existence as blebs. The resulting ulcers have little tendency to heal, and piled-up-scales, crusts and scabs—aptly compared to flaky pie-crust—are formed, which exhale a peculiarly offensive odour. There is more diffuse erythema than in *P. vulgaris*, and the whole body-surface is ultimately involved; the hair and nails fall out, the eyelids become everted, the nasal and buccal orifices dilated. Finally, the mucous membranes are involved, the constitutional disturbance is great, and the patient dies in an exhausted "typhoid" condition.

Pathology.—This is very obscure, but recent researches have thrown some light upon it. Probably the primary change is in the vaso-motor centres in the spinal chord, bleb formation being common in many of its diseases, especially myelitis, spinal meningitis, tabes dorsalis and progressive muscular atrophy. Local irritants—*e.g.*, pressure—may determine the localization of blebs, and, generally speaking, irritant lesions are more apt to produce the disease (or conditions similar to it) than paralytic ones. Evidences of inflammation and degeneration have been repeatedly demonstrated in the peripheral nerves, but the question whether these are primary or secondary is still a moot one.

The bullæ result from rapid serous effusion among the loose cells of the rete Malpighii, which soon filters through them to raise the granular and horny layers of the cuticle to form the roof of the bleb. Diapedesis of leucocytes, hæmorrhage, &c., ensue, according to the intensity of the process. In cases fatal from diarrhœa, extensive and deep ulceration of the large intestine has been observed.

Diagnosis.—After the preceding description, the differential diagnosis from

other vesicating diseases may be briefly dismissed. Scabies in children, impetigo, bullous dermato-syphilis, herpes, vesicating urticaria, and self-inflicted injuries with blistering agents, may present some superficial resemblance to *P. vulgaris*, acute or chronic. The relationship to erythema multiforme has been already referred to. Dermatitis exfoliativa (pityriasis rubra) and universal lichen planus may simulate *P. foliaceus* very closely.

Treatment must be constitutional as well as local, and prime importance must be attached to careful nursing. Complete rest in bed is, of course, necessary. The diet must be nutritious, and alcoholic stimulants—preferably wine—are often indispensable. A certain number of cases yield to arsenic freely administered, and with the usual precautions, but, unfortunately, the drug is by no means invariably the “magic wand” some enthusiastic partisans have described it as being. In a large number of cases, especially where the mucous membranes are involved, opium is of signal service; to ensure its full benefit, the remedy must be pushed and insomnia relieved. Iron and quinine may also be of service.

Local treatment varies with the phase of disease present. Mild forms may be simply dusted with oxide of zinc powder, salicylated starch, or lycopodium, and the parts wrapped in cotton wool. In severer cases the blebs should be pricked before these remedies are applied. Great relief is often experienced by swathing the parts in cloths soaked in carron oil, calamine liniment (calamine $\mathfrak{D}\text{ij}$, zinc oxide $\mathfrak{z}\text{ss}$, lime water and olive oil, of each, $\mathfrak{z}\text{ij}$), or weak carbolic oil. When the condition is subsiding the glycerole of lead subacetate (1 to 6 of water), or milk lotion (liq. plumbi subacetatis $\mathfrak{z}\text{ij}$ to $\mathfrak{z}\text{ij}$) are clean and convenient lotions. In the later stages, when the lesions are drying, oleates of zinc or bismuth, borax, &c., in the form of ointments, have their uses.

In the severest forms no treatment is equal to that of the continuous tepid bath, which affords the greatest relief to the sufferings of the patient, and may apparently be employed for an indefinite period of time. The fœtor of *P. foliaceus* and *P. vegetans* is best masked by dusting with iodol; while chlorinated soda gargles ($\mathfrak{z}\text{j}$ of the liquor to water $\mathfrak{z}\text{vj}$) are specially useful for the affections of the mouth.

J. J. PRINGLE.

PERCUSSION.—A method of physical examination in which some part of the body is struck with a view either to elicit sound or to estimate density of substance.

In the methodical examination of the chest and abdomen the act of percussion follows that of palpation.

A slight difference in resonance brought out by an experienced examiner can be easily appreciated by others, but it requires long practice before the student is able to elicit the true note for himself, percussion being by far the most difficult of the arts of physical diagnosis. As an indication of the condition of the subjacent structures the degree of “resistance” experienced on percussion is only second in importance to the alteration in sound.

Method of Percussing.—The use of any instrument, either in the form of a hammer as *plessor* or a flat piece of ivory as *pleximeter*, is, in this country at least, now almost a thing of the past.

The best pleximeter is the finger, the middle finger of the left hand being generally used. It must be applied firmly to the part, and should be struck with one, two, or three fingers of the right hand, the fingers being flexed, the blow delivered from the wrist, and not from the elbow, and vertically to the pleximeter.

Light percussion is best when it is desired to elicit sound from the parts immediately subjacent or to map the outline of the thoracic or abdominal viscera, also whenever there is tenderness of the chest wall and, speaking generally, when examining the front of the chest. Over the supra-spinous fossæ and inter-scapular regions, however, it is often necessary to give a firm blow in order to bring out slight differences in resonance. This is sometimes termed “deep” percussion.

The clavicles are percussed by tapping them directly with the finger. It is often possible to make out slight differences in resonance by percussion of the clavicles when no variation from the normal can be detected elsewhere; this step should therefore never be omitted in the examination of doubtful cases of apical phthisis.

The sounds elicited from different chests and from different parts of the chest vary considerably; it is therefore essential in all cases to compare the note obtained over any spot with that from the corresponding part on the opposite side; interspace must be compared with

interspace, clavicle with clavicle, and rib with rib, the pleximeter finger being similarly applied and struck with equal force in each case.

In percussing the back of the chest the patient must be directed to lean forwards, to fold the arms and to "let the shoulders drop," so as to completely relax the scapular muscles.

Theory of Percussion Sounds.—As already stated, percussion is an art only to be acquired by long practice, and its acquisition and application are but little assisted by a knowledge of the various conflicting theories which have been from time to time put forward to account for the normal and abnormal sounds so elicited.

It is now accepted by most writers that the sound which is obtained when the healthy chest is percussed is mainly due to "the vibration of the thoracic walls alone" (Bristowe), and that any condition which interferes with the vibration of the chest walls alters the percussion note. According to another view, however, the middle-sized and largest bronchia are the seat of the vibrations which produce the normal percussion tone.

The nomenclature of percussion sounds is almost as confusing as that of auscultation, but for the reason stated under that heading the terms mentioned in the Provisional Report of the Committee of the International Medical Congress have been here adopted.

Before proceeding to describe them, it is necessary to refer to some of the synonyms in ordinary use and also to describe the normal percussion signs. The term "dulness" is held to imply absence of "tone" (Gee). "Tone" being the result of the regular succession of impulses which are present in a musical sound, but lacking in a mere noise.

Not only may the normal tone be lost, but "adventitious" tones may be acquired which vary much in "pitch." Of these, the highest pitched tone is that produced by percussion over a bone (osteal); next in descending scale comes a tone resembling that produced by percussion of the trachea when the glottis is open (tubular or tracheal); the lowest pitched tone, being that produced by percussion over a hollow cavity, containing air, *e.g.*, the stomach (tympanitic). The tone over healthy lung (normal percussion tone) comes in point of pitch after the tracheal tone.

Normal Percussion Sounds.—By long practice a physician is able to form for

himself a normal standard of resonance for different regions of the chest, regard being had for the condition of the parietes and other considerations. This is of service when the percussion note of healthy lung cannot be obtained owing to the presence of disease in corresponding areas on both sides of the chest.

Taking the front of the chest from above downwards, the normal condition of the percussion sounds is as follows:—

Resonance commences about $1\frac{1}{2}$ in. above the clavicle; it is equal on the two sides until the sound is modified owing to the presence of the liver on the right side, and on the left of the uncovered portion of the heart.

The *liver dulness* commences at the sixth rib in the nipple line; it may be said to be bounded above by a horizontal line extending outwards on a level with the base of the ensiform cartilage, and below by the costal margin in the mammary line, in the median line it extends about $1\frac{1}{2}$ in. below the base of the ensiform cartilage. On the left side the outline of the *præcordial dulness* is normally roughly triangular, being bounded externally by a line drawn from the centre of the sternum opposite the junction of the fourth costal cartilages to the apex beat in the fifth interspace an inch within the mammary line, below by a horizontal line drawn from the latter point inwards, internally by the mid-sternal line uniting the two.

The *splenic dulness* extends from the ninth to the eleventh rib on the left side, in the posterior axillary line; it is oval in area.

Behind, the percussion note in the supra-spinous fossæ, owing to the thickness of the muscles, is less resonant; in the inter-scapular region it is somewhat more resonant, and in the infra-scapular region the note is almost equal to that beneath the clavicles.

The lower margin of resonance on the right side is at the tenth rib, and on the left at the eleventh rib or thereabout.

The following varieties of morbid percussion sounds are generally recognized:—

Increased Resonance; Hyper-resonance.—This sound has the quality of the exaggerated normal percussion note, combined with a trace of the tympanitic note; it is of more marked intensity than the normal note and of lower pitch. It is elicited by percussion over emphysematous lung.

Tympanitic Resonance.—A somewhat musical sound of varying pitch, heard on percussion over distended stomach or

bowels, or over a pleural cavity containing air, or over a very large pulmonary cavity.

Skodaic Resonance.—A clear high-pitched sound of tympanitic quality, produced on percussion over the upper part of the chest (infra-clavicular region especially) when the pleural cavity contains fluid. It is believed to be due to the relaxation of the upper part of the lung which, however, still remains in contact with the chest wall.

Diminished Resonance.—Dulness varying in degree. A sound shorter, sharper, and higher in pitch, and lacking the tone of the normal note. It may be of a quality similar to that produced by percussion over a piece of wood (wooden), or a bone (osteal). The sound usually signifies either incomplete consolidation or displacement of the lung, or the presence of some morbid condition of the pleura. With diminished resonance there is almost always increased resistance on percussion.

Absence of Resonance; Absolute Dulness.—A high-pitched note from which all tone is absent. The sound is elicited by percussion over a pleural cavity containing fluid, or over completely consolidated lung or a solid growth within the chest, in contact with the pleura.

Amphoric Resonance; Tubular Percussion Note.—A sound similar to that obtained by percussing the trachea with the glottis open, usually produced over a large superficial cavity, with free bronchial communication, and often accompanied by the "cracked-pot sound."

Cracked-pot Sound; Bruit-de-pôt-fêlé.—A sound having an amphoric and slightly metallic quality produced on percussion over a superficial cavity, with slightly yielding walls and free bronchial communication, the glottis being at the time open.

J. K. FOWLER.

PERICARDIUM, DISEASES OF.

—Under this heading the following affections of the pericardium are described:—

1. Pericarditis.
2. Pericardial Adhesion.
3. External Pericarditis.
4. Hydropericardium.
5. Hæmopericardium.
6. Pneumopericardium.

1. *Pericarditis.*—Inflammation of the pericardium accompanied by an effusion of fluid within the pericardial sac, may be the result of some morbid condition of the blood, as in acute rheumatism, scarlatina, measles, small-pox, septicæmia, nephritis, &c.; or it may be due

to extension of disease from neighbouring organs, such as the heart, pleura, lungs, bronchial glands, mediastinum, œsophagus, vertebræ, ribs, sternum, mammary gland, or peritoneum. In the great majority of cases the pericardial inflammation is dependent on acute rheumatism, chronic nephritis being the next most common cause.

Tuberculosis is not unfrequently concerned in the production of pericarditis. In one form the pericardium is involved in common with the pleura or peritoneum without similar disease elsewhere. At other times caseous mediastinal glands, or pleural tuberculosis, occurring in the course of pulmonary phthisis, may lead to pericarditis by extension, and occasionally the pericardial affection is part of a general tuberculosis. Pericarditis may supervene in the course of acute pneumonia, either as the result of extension or of toxæmic causes. In rare cases the affection can be traced to direct injury, and at times it appears to develop without any definite cause (idiopathic pericarditis).

SYMPTOMS AND COURSE.—In cases where the effusion is not very extensive, there may be no definite symptoms, though in individual instances pericarditis occasions severe pain in the præcordial region and epigastrium. Large collections of fluid are invariably associated with a sense of oppression, or even with severe dyspnoea, and palpitation is frequently complained of. Dyspnoea is to be attributed to the small amount of blood entering the heart and passing through the lungs, diminished pulmonary circulation leading to imperfect oxidation of the blood, with dyspnoea as its necessary consequence. Anæmia of the arterial system is very apt to give rise to cerebral symptoms, drowsiness, delirium, headache. Acute pericarditis is attended by a varying degree of pyrexia, and occasionally is ushered in by a distinct rigor. In other cases the onset of the affection is very insidious, and especially in the subjects of nephritis, pericarditis may escape detection altogether, as it commonly develops during the later stages of the disease. The existence of pericarditis can seldom be inferred from symptoms, and for its recognition we must depend on physical examination. In cases of long-continued effusion, a degree of venous stasis may be induced, resembling that which occurs in affections of the mitral valve. At the same time, however, it must be stated that this condition is often the result of more

than one cause, the effects of mechanical pressure being supplemented by the superposition of myocardial debility, which may depend on combined valvular disease and pericarditis.

Effusion into the pericardium occurring in the course of acute rheumatism is rarely fatal, though occasionally the amount of fluid may be so extensive as to endanger life from the effects of pressure upon the heart and large vessels. Absorption is usually a slow process, except when the effusion is a small one, and some degree of adhesion of the visceral and parietal surface usually results. In cases of pneumonia and renal disease, pericarditis is an ominous symptom, and generally augurs a fatal termination. Tubercular pericarditis is seldom accompanied by much effusion, and, as a rule, does not occasion marked symptoms. Purulent effusions are commonly fatal. The complications that are liable to arise are to be regarded as the effects of pressure. Thus dysphagia, aphonia and hiccup have been attributed to compression of the œsophagus, recurrent laryngeal, and phrenic nerves respectively. Large effusions exercise pressure on the left lung, and so increase the existing dyspnoea. Thrombosis of the left innominate vein has been known to result from pericardial effusion.

Patients suffering from this disease generally have a pale, ashy complexion, and some distension of the veins of the neck is often visible. The face betrays anxiety, and the respiratory movements are increased in frequency. Orthopnoea is frequently observed; but in some cases of extensive effusion the decubitus is dorsal, the object being to diminish the anæmia of the brain as far as possible.

PHYSICAL EXAMINATION OF THE CHEST.—*Inspection* reveals bulging of the præcordia, and effacement of the intercostal spaces. At times the chest walls are slightly œdematous. The impulse of the heart is indistinct, and may be invisible.

Palpation.—The apex beat is feeble, and the impulse is often diffused. Sometimes the apex beat appears to be situated in the fourth intercostal space, but in such cases the impulse is probably communicated from the right ventricle, the apex being separated from the chest wall by the effused fluid. A friction fremitus may occasionally be detected when the hand is placed over the præcordia.

Percussion.—The area of cardiac dul-

ness is increased. In the early stage, when the patient is in the recumbent position, the presence of pericardial effusion is first detected at the base of the heart, the dulness reaching up to the second or third rib on the left side. As the effusion increases, the præcordial dulness assumes a pyriform or roughly triangular shape, the apex pointing upwards, the base downwards.

These changes in the form of the cardiac dulness are thus explained.

Owing to the fact that the pericardial sac is more loosely disposed around the great vessels at the base of the heart than elsewhere, the fluid accumulates here in the first instance, but when the pericardium becomes further distended the effusion separates the two surfaces of the serous membrane in all directions, and the fluid gravitates towards the most dependent part. The area of dulness is greater when the patient sits up than when he lies down, inasmuch as in the latter case the fluid has a tendency to sink behind the heart. Changes in position are not uncommonly attended by a shifting of the line of dulness to the right or left.

In some instances the præcordial dulness extends further to the left than the position of the apex beat, owing to the distension of the pericardial sac.

Auscultation.—When the amount of effusion is not sufficient to separate the pericardial surfaces completely, a friction sound or rub is heard, corresponding more or less accurately in rhythm with the movements of the heart, but in some cases, and these often of a very acute character, no friction sound can be detected at any period of the disease. Pericardial friction is generally most marked towards the base of the heart, though it may be audible over the whole cardiac region. The rubbing sound is commonly systolic, but it may be both systolic and diastolic. The distinction of pericardial friction from an endocardial murmur is generally, though not invariably, an easy matter. Pericardial friction is often less accurately coincident with the heart sounds, it is rougher, more grating or creaking in character, and seems to be closer to the ear. The localization of the sound does not always agree with the point of maximum intensity of the different endocardial murmurs, moreover, it does not show the same tendency to propagation in definite directions, and is often heard over a very limited area. The loudness of the friction sound is usually increased by pres-

sure with the stethoscope, causing the two roughened surfaces of the pericardium to come closer together. Variations of intensity are often produced by a change of posture, friction being most distinctly audible in the upright position. As the effusion increases and separates the pericardial surfaces, the rub is no longer heard, and the heart sounds become weak and distant.

The degree of effusion cannot be determined solely by the extent of præcordial dulness, a point which should always be borne in mind. Cardiac dilatation, especially if it be combined with retraction of the margins of the lungs, may simulate an extensive effusion when the amount of pericardial fluid is comparatively small. Large effusions, on the other hand, sometimes give rise to very little increase of præcordial dulness when they gravitate to the posterior aspect of the serous sac. Emphysema also masks the existence of pericardial effusion to a considerable extent. Depression of the diaphragm, liver and spleen may be caused by large pericardial exudations. When the left lung is compressed, dulness to percussion and weak breath sounds are discovered at the posterior base. In cases of large effusion the pulse is generally weak, small and irregular, and its frequency is increased. It should, however, be remembered that the condition of the pulse is determined not merely by the amount of effusion, but also by the nutrition of the myocardium. In some cases a "pulsus paradoxus" is observed (*vide* External Pericarditis).

DIAGNOSIS.—Pericardial friction is the only pathognomonic sign of pericarditis, but this adventitious sound is sometimes wanting, when the conditions necessary for its production are present, viz., roughened surfaces without much effusion. Absence of the characteristic rub in these cases is believed to depend on weakness of the cardiac contractions. A pleuro-pericardial friction sound depending on roughening of the pleural surface in the vicinity of the heart, and commonly audible at the margins of the cardiac area, may sometimes be distinguished from true pericardial friction by observing that the sound is modified when the patient holds his breath, but at times an accurate decision is impossible.

When copious exudation has occurred and friction is no longer audible, the diagnosis of pericarditis can usually be made by attention to the following points:—The peculiar shape of the præcordial dulness, enfeeblement of the

impulse and sounds of the heart, and the occasional but characteristic relation of the apex beat to the left margin of the cardiac dulness. When pericarditis is complicated by effusion into the pleura, diagnosis may be impossible in the absence of a pericardial friction sound.

PROGNOSIS.—The prognosis depends to a great extent on the nature of the primary disease. When pericarditis appears in the course of rheumatic fever, the prognosis is favourable, whereas in chronic cases and in those which are complicated by valvular disease, the chances of recovery are not so good. Pericarditis, when secondary to pneumonia or renal disease, is generally fatal.

MORBID ANATOMY.—The changes met with in pericarditis are very similar to those that accompany inflammation of other serous membranes. The surface of the pericardium first becomes dull, slightly injected and roughened, and subsequently a fibrinous exudation occurs. The process may stop at this point, but very commonly an effusion of fluid ensues. The effusion is almost always sero-fibrinous in acute rheumatism and renal disease. Purulent exudation is generally a consequence of suppuration in adjacent organs (*e.g.*, empyema, spinal, costal, or sternal abscesses), perforation of the pericardium by new growths of the œsophagus, or pyæmia.

A hæmorrhagic character is occasionally imparted to the effusion, when the morbid process depends on tuberculosis, or malignant disease, and in the rare instances in which pericarditis develops in the course of scurvy or purpura. Putrefactive changes may be set up in certain cases of purulent effusion, and it has been asserted that this event is at times associated with the formation of gas in the serous cavity.

Sero-fibrinous effusions may become absorbed without leaving behind them any trace of their existence beyond a localized or diffused thickening of the serous membrane. More frequently, acute pericarditis is succeeded by a chronic stage in which the fibrinous exudation undergoes organization, and adhesion of the visceral and parietal pericardium is produced. When the adhesion is partial, effusion is apt to recur from time to time, and ultimately the two surfaces of the pericardium may become universally adherent. General or localized adhesions are not unfrequently the results of an essentially

chronic pericarditis. Calcification is occasionally associated with fibrous thickening and adhesions. The milk spots or white patches, so often met with on the visceral pericardium, especially over the anterior surface of the right ventricle, may be sequelæ of acute inflammation, but more often they represent a process that has been chronic from the first.

The inflammation of the serous membrane at times involves the outer fibrous laminae of the pericardium (external pericarditis), and may thence extend to the pleuræ. In other cases, external pericarditis is secondary to pleurisy or inflammatory affections of the mediastinum, the serous surface of the pericardium being frequently unaffected.

As the result of these changes, fibrous adhesions are apt to form between the pericardium, sternum, and large vessels at the base of the heart (mediastino-pericarditis, mediastinitis fibrosa).

Inflammation of the pericardium is always to some extent propagated to the muscular walls of the heart, though the degree of myocarditis produced varies considerably. The peripheral layers of the myocardium become more or less softened, and acquire a dull yellowish appearance. At times when the pericardial thickening is very extensive, the heart seems to be enveloped in a fibrous or calcareous capsule, and in such cases the cardiac walls are thin and atrophied. Dilatation of the heart is very commonly induced, as the result of concomitant myocarditis and fatty degeneration. Hypertrophy is never a direct result of pericardial adhesion, but is due either to co-existing valvular disease or to other recognized causes of cardiac hypertrophy.

When the amount of pericardial effusion is large, the diastolic expansion of the heart is interfered with, the quantity of blood entering from the veins is curtailed, and a condition of venous stasis and arterial anæmia is produced. Extensive effusions exercise more or less pressure on the left lung, œsophagus, trachea, recurrent laryngeal nerves and other neighbouring structures.

TREATMENT.—In most instances no direct treatment is called for beyond the application of a pad of cotton wool or a poultice to the præcordial region. The Germans prefer an ice-bag. Blisters sometimes seem to be of service. Iodide of potassium has been recommended to promote absorption, but its influence is doubtful.

Complete rest in bed and the avoidance of any sudden movement are of great importance. A light nutritious diet should be ordered.

When the heart's action is feeble and rapid, digitalis is indicated and alcoholic stimulants may be administered.

In cases of very great effusion, where pressure effects appear, the question of paracentesis should be considered. When this operation is contemplated, an exploratory puncture should always be made as a preliminary measure, the fourth or fifth intercostal space an inch to the left of the sternum being the point usually selected. Aspiration has proved successful in several cases, and when carefully performed, the operation is attended with very little danger.

Free incision has been practised in a few instances of purulent pericarditis with excellent results. (See a successful case by S. West, *Med. Chir. Trans.* vol. lxi.)

2. Pericardial Adhesion.—The two surfaces of the pericardium may be universally adherent without any ill effects being produced. In certain cases, however, this condition is accompanied by a marked degree of cardiac dilatation. These differences probably depend on the varying extent to which pericarditis involves the subjacent myocardium. The presence of pericardial adhesions may at times be recognized, but more often the diagnosis can only be conjectural. A general systolic retraction of the intercostal spaces over the præcordia is the most trustworthy sign of an adherent pericardium. If the two surfaces of the serous membrane be united and at the same time the pericardium be fixed to the sternum, this phenomenon is more likely to occur. In such cases rebound of the chest wall and sudden collapse of the jugular veins may occasionally be observed during diastole. Systolic recession confined to the region of the apex beat is less uncommon and is frequently unconnected with pericardial adhesion.

The fact that the margins of the cardiac dulness are unaffected by deep inspiration and the absence of any shifting of the apex beat with changes in the patient's position have also been regarded as symptoms of adherent pericardium, but neither of these signs can be relied upon.

3. External Pericarditis.—This condition may give rise to a pleuro-pericardial friction sound. When fibrous adhesions have formed between the

sternum, external pericardium and great vessels at the base of the heart, a peculiar modification of the pulse is sometimes observed (Griesinger and Kussmaul). This consists in distinct intermissions of the pulse corresponding with each inspiration (*pulsus paradoxus*). This alteration of the pulse has been attributed to tightening of the adhesions around the aorta by the descent of the diaphragm and by the outward movement of the ribs and sternum which occurs during inspiration (*see PULSE*).

The fact that the "*pulsus paradoxus*" has also been observed in pericardial effusion and in other conditions, *e.g.*, in a case of extensive effusion into the left pleura, proves that the explanation just mentioned does not suffice for all cases. Rosenbach found by experiment that when the intra-pericardial portion of the vena cava inferior was compressed to a certain extent, a typical "*pulsus paradoxus*" was produced. Each deep inspiration gave rise to complete constriction of the vein as it passed through the diaphragm, a fall of blood pressure and weakening of the heart sounds occurring simultaneously. These facts prove, as Rosenbach points out, that the "*pulsus paradoxus*" may be due to insufficient entry of blood into the heart.

4. **Hydropericardium.**—Dropsy of the pericardium is generally the result of renal disease, valvular lesions, or chronic affections of the lungs. Pericardial friction does not develop, but with this exception the physical signs are the same as in pericarditis with effusion, and the differential diagnosis of the two affections is not always easy.

Treatment must be directed to the primary disease, and when the amount of fluid is very great, paracentesis may be resorted to.

5. **Hæmopericardium.**—An effusion of blood into the pericardial cavity commonly depends on bursting of an aortic aneurysm, but this accident may also be caused by rupture of the heart or of aneurysms of the coronary arteries. Rupture of the heart may be the result of myocarditis, infarction, fatty degeneration or cardiac aneurysm, or it may be due to direct injury.

Death is speedily produced from the effects of pressure upon the heart.

6. **Pneumopericardium.**—The presence of gas in the pericardial sac is either the result of traumatic causes, or of communication between the pericardium and air-containing organs like the œsophagus, stomach, or lung, or the

pleura. In the latter case, perforation depending upon ulcerative or suppurative processes, almost always leads to purulent pericarditis, which terminates fatally. The physical signs of this rare condition are, tympanitic resonance over the præcordial region, metallic gurgling or splashing sounds, synchronous with the heart's movements, and amphoric echo of the heart sounds, endocardial murmurs, or pericardial friction. Slight dulness in the situation of the heart may sometimes be detected when the patient sits up.

PERCY KIDD.

PERIHEPATITIS.—Inflammation of the serous covering of the liver.

This affection may occur as part of a general peritonitis, but more frequently it is secondary to some disease of the liver or is an extension of inflammation from neighbouring parts. Acute perihepatitis, in addition to its relation to acute general peritonitis, arises from extension of inflammation in empyema of the same side, from ulceration of the stomach, and where an abscess of the liver reaches the surface. Chronic perihepatitis occurs in all forms of cirrhosis and in new formations, especially syphilis and tubercle, also as a result of pressure—*e.g.*, from tight-lacing and from the pressure of a greatly hypertrophied heart, and from other causes.

Symptoms.—The chief symptom of acute perihepatitis is acute cutting pain; there may be some degree of fever with slight jaundice, and a friction sound may be heard over the seat of the pain. In chronic perihepatitis the organ is often altered in size and shape; friction may be audible, but very often adhesions prevent the descent during deep inspiration. All these signs may, however, be absent, and frequently the condition can only be inferred during life, or is discovered after death.

Diagnosis.—As already stated, it is not always possible to detect chronic perihepatitis—acute perihepatitis is liable to be mistaken for pleurisy.

Prognosis.—The prognosis depends upon the cause.

Morbid Anatomy.—In acute perihepatitis, not being part of an acute general peritonitis, a circumscribed area of the surface of the liver presents a milky appearance, and is covered with lymph. In chronic perihepatitis the capsule is much thickened, in places forming fibrous bands and wedge-shaped layers of considerable thickness, especially where there has been loss of liver substance, as in

gummatous cirrhosis and tubercle of the liver. In cardiac cirrhosis the capsule is often universally thickened, and the organ assumes a globular form from flattening of its anterior margin. Adhesions to neighbouring organs often result.

In many cases of atrophic cirrhosis accompanied by ascites a fenestrated membrane can be detached from the liver, the fenestræ corresponding to the "nodules" on the surface of the organ. A similar membrane, but of more uniform texture, is generally in such cases present over the whole surface of the peritoneum, although its presence may easily be overlooked. The perihepatitis is in such cases part of a slowly progressive chronic peritonitis. A similar membrane is often present on the pleura in cases of hydrothorax secondary to valvular disease of the heart.

Treatment.—Acute perihepatitis may be relieved by rest and turpentine stupes, or hypodermic injections of morphia. This treatment should be combined with a dose of calomel or euonymin, followed by a saline purgative. In chronic perihepatitis no treatment can be of any real service. ROBERT SAUNDY.

PERIMETRITIS (Pelvic Peritonitis).—Inflammation of the peritoneum about the uterus, having its origin in disease of the uterus or its appendages. It is also called *pelvic peritonitis*. This latter term is less convenient, because the local peritonitis resulting from disease of the uterus or its appendages is not always limited to the pelvis, and because the pelvic peritoneum may become inflamed from disease of parts other than the uterus or its appendages.

Perimetritis is always a secondary affection, produced by inflammation of the uterus, or of the tubes, or of the ovaries, or by noxious discharges through or from the tubes or ovaries, or by mechanical injuries. More particularly may be mentioned injury in labour, intra-uterine pessaries, tents, operations upon the uterus, gonorrhœa, puerperal or other endometritis, uterine cancer, uterine fibroids, ovaritis, salpingitis and tubercular disease of the tubes. It may also arise by extension from parametritis, with which it often co-exists. It is often attributed to cold.

There are three chief varieties of perimetritis: *adhesive, serous, and suppurative*. The first of these is the most common, and is often attended with symptoms so slight as scarcely to be noticed by the patient. Serous perimetritis is the least

common. Suppurative peritonitis is the most serious.

Symptoms.—Perimetritis commences with febrile disturbance and pain in the lower abdomen. There may be shivering, but there is not usually a well marked rigor. There is rise of temperature, acceleration of pulse and respiration (which is less abdominal than normal), loss of appetite and thirst. The patient lies on her back, with the knees drawn up. The pain is referred principally to the lower abdomen, and often described as worse over one ovarian region. There is tenderness on pressure, and the abdominal walls are held rigid. There is often irritability of the bladder, and there may be slight scalding pain on micturition. Defæcation is often painful, the pain more especially preceding the act. These symptoms may prove to be the beginning of general peritonitis. But if the inflammation remain merely a perimetritis, in the course of a few days they will diminish in severity, the temperature falling, and the pain becoming less. The rapidity with which improvement begins to be apparent will depend very much upon the treatment. When the intensity of the onset has subsided, pain, tenderness, slight fever and debility linger on for, it may be, weeks, gradually becoming less. When all symptoms have completely disappeared, a slight relapse is common, and may be followed by another, so that the date of ultimate complete freedom from all symptoms cannot be definitely stated. These symptoms are met with in all varieties of perimetritis, and, indeed, all kinds of pelvic inflammation. The diagnosis of perimetritis can only be made by physical examination.

Signs.—In the early stage of the disease, when the process has not advanced beyond injection of the peritoneum, and the exudation of a little inflammatory lymph, the only physical signs are pain on moving the uterus and fulness, that is, increased resistance to pressure, around the uterus. At a later stage of the disease, the exudation of lymph becomes more abundant, and is gradually organized into fibrous tissue, which, in course of time, becomes increasingly hard and dense. After the first few days, there is felt as it were a hard roof to the pelvis, joining the uterus on each side, at or a little above the internal os, dipping down behind as low as the os externum or even lower; at the sides retreating out of reach of the finger, in front not felt by the finger. The uterus is fixed,

and after a few weeks' duration it becomes no exaggeration to say that the exudation feels "as hard as a board."

In *adhesive* perimetritis, although on vaginal examination the induration closely simulates a tumour, yet on bimanual examination, which is difficult to make satisfactorily without anaesthesia, owing to the rigidity of the abdominal walls, it will be found that there is no tumour, but that the hardness is merely thickening of the peritoneum covering the pelvic viscera. All the parts in contact with this sheet of peritoneum—uterus, tubes, and adjoining bowel—are matted together by adhesions. In the interspaces of these adhesions there is often a little serous fluid, but not enough to form a distinctly outlined swelling.

In some comparatively rare cases there is a large effusion of serous fluid, which becomes enclosed in a space limited by inflammatory adhesions. This is *serous* perimetritis. Such swellings are usually behind the uterus, and displace it forwards. They may obstruct defaecation or micturition. Being bounded by matted intestine, they are often resonant on percussion, whilst from the thickness of the parts which separate them from the exploring hands, it is seldom that fluctuation can be distinctly felt.

In *suppurative* perimetritis there is a collection of pus bounded by adhesions among the bowels. Inflammation so acute as to lead to the formation of pus, is apt to spread, and an abscess may form near the uterus; or the inflammation may be merely adhesive in the neighbourhood of the uterus, and suppurative at a part of the peritoneum remote from it; or there may be several abscesses at different parts. Hence perimetric abscesses are not at all regular in their position and outline, and the largest are not globular, but sinuous, irregular and present pouches in all directions.

Diagnosis.—It is not difficult to ascertain the existence of perimetritis. The pain, the fever, the fixity of the uterus, and the induration around it, plainly indicate the disease. If the case be not seen until after the acute symptoms of the onset have subsided, we may feel in doubt whether the swelling present behind and around the uterus is the result of inflammation, or a hæmatocele. An opinion can only be formed by the history of the mode of onset; it is not possible from the character of the swelling, to tell whether Douglas's pouch is occupied by blood, pus, or serum. In

perimetritis, the difficulty is to ascertain what morbid conditions underlie and co-exist with it. To do so may be impossible in the acute stage of the disease, but as the perimetritic symptoms subside, the symptoms and signs of any disease which remains, such as diseased tubes, ovarian cysts, or uterine fibroids, will become clearer. Serous perimetritis may form a swelling very difficult indeed to distinguish from an ovarian cyst; if a tumour, apparently a cyst, be discovered for the first time as an attack of perimetritis is subsiding, it is well to wait a few weeks and watch its course before deciding on an operation.

Prognosis.—In perimetritis, if the cause which produced it be not still in operation, the tendency is to recovery. In the course of time effused serum is absorbed, adhesions stretch and become looser, and the viscera are less firmly fixed, the adhesive bands may at length become elongated, so as to in no way interfere with the functions of the organs they bind together. But if the cause persist, repeated attacks are likely to occur. When the patient has had many attacks, as is often the case when the tubes are diseased, there may be great fibrous thickening of the peritoneum, and extensive and dense adhesions. These generally give rise to persistent pain. If the uterus be flexed, perimetritis may lead to its being fixed in the bent position, and when so held secretions may accumulate in its cavity, and hæmato-, hydro- or pyo-metra be the result. On the whole, therefore, the prognosis, although favourable as to risk to life, should be guarded as to the patient's future good health. In suppurative perimetritis the prognosis is more unfavourable than in the other forms.

Treatment.—The patient should be kept in bed as long as either fever or much pain is present. The pain of perimetritis is seldom severe enough to require opium, and if there be severe pain it seldom lasts longer than a few days. The drug, when needed, is better given locally, in the form of morphine suppositories, or a liniment of oleate of morphine (2 to 4 per cent.) may be painted on the abdomen, or laudanum may be sprinkled on poultices. Opium should be omitted as soon as possible, as it disturbs digestion, and by confining the bowels, favours the formation of scybala, the passage of which past the inflamed pelvic peritoneum, and the straining called for to expel them, may cause the patient a great deal of suffer-

ing. To relieve this, laxatives should be given, so as to keep the stools soft. Another reason for caution in the use of opium is that slight pain may persist long, and if the patient be accustomed to look to opium for relief, she may need increasingly large doses, and in time become unable to do without it. The best means of at once lessening inflammation and relieving pain is the use of counter-irritation, such as poultices of linseed and mustard (mustard 1, linseed 4: mix the mustard with the water before the linseed); turpentine stupes; small blisters, one every three or four days; or lin. iodi every other day, or less often. Aconite or belladonna may be used locally. Pessaries of aconitia (gr. $\frac{1}{2}$, gelatin mass $\mathfrak{D}\text{ij}$) are useful. Alcohol is better withheld, unless the pulse be so feeble as to clearly indicate its use, or it be found that small doses aid digestion. Regulation of the diet is not so important in this form of local peritonitis as in that which depends upon disease of the alimentary canal. Under treatment conducted on these lines, most cases progress slowly towards recovery although there may occasionally be a slight relapse.

It may be found within the first few days that the case, though carefully treated, is not tending towards recovery; the symptoms pointing rather to the spread of the inflammation. The pain becomes worse, the tenderness more diffused, the fever higher, and the prostration greater. Acute symptoms such as these may quickly develop in a case which seemed to be going on favourably. Under such circumstances it is clearly not advisable to wait for the peritonitis to become general, or for the patient to become hopelessly exhausted. The abdomen should be opened without delay, the site of the inflammation, which will probably be the tubes or ovaries, sought for, the products of inflammation removed if possible, and the abdomen washed out and drained.

In serous, or in suppurative perimetritis pressing on the bowel or the bladder, or associated with persistence of severe febrile symptoms, Douglas's pouch may be bulged downwards by the inflammatory effusion. In such a case, it will be proper to tap the swelling with an aspirator needle, and having thus ascertained beyond doubt that it is a fluid effusion, to make a free incision, and let the serum or pus out. But if, although the character of the symptoms calls for

interference, there are no clear indications that the effusion is so situated that it can be let out by vaginal incision, abdominal section is to be preferred.

G. E. HERMAN.

PERINEPHRITIS. — Inflammation of the fibrous and fatty tissue surrounding the kidney.

Perinephritis may be primary, that is, independent of disease in any other parts, or secondary. A further division of secondary perinephritis may be made according as the primary disease is situated in the kidney itself, or in some other part, not necessarily near the kidney.

The primary form is most frequently due to traumatism, in the shape of blows upon the lumbar region, bruises, or actual wounds penetrating to the perirenal tissue. It may also in some cases be the result of strain of the psoas and lumbar muscles, or of sudden chill of the heated body, and it arises occasionally in the course of pyæmia and the specific fevers.

Secondary perinephritis is more frequent. Its most usual cause is some previous disease of the kidney itself. This may be an inflammation of the kidney or of its pelvis, which, however induced, affects the perirenal tissue by direct extension, or which, being itself suppurative in character, causes extravasation of pus into the surrounding parts.

Tumours, hydatid and other cysts, and tubercle of the kidney may so irritate the surrounding tissue as to produce inflammation. Calculus of the kidney is a most frequent cause of perinephritis. It acts either by inducing an inflammation of the kidney tissue, which, by direct extension, or by rupture of an abscess, affects the perinephric tissue, or by causing ulceration of the pelvis of the kidney and extravasation of urine. The stone itself may come to lie actually outside the kidney. It is to be noted also that such a renal fistula may be caused by other conditions, such as tubercle, tumour, or hydatids of the kidney. Further, disease of other parts even far distant from the kidney may cause perinephritis. Thus, typhlitis and perityphlitis, parametritis (pelvic cellulitis), the result of operations upon, or of inflammation of the pelvic organs, ulceration and perforation of the colon, and of the gall-bladder, abscess of the lung or empyema, and abscesses in connection with caries of the vertebrae, may by extension along the planes of con-

nective tissue, affect the perirenal tissue, whilst leaving the kidney intact.

When not the result of rupture of a renal abscess, or of extravasation of urine, perinephritis is frequently non-suppurative. It then shows itself as a thickening of the perirenal tissue causing firm adhesion of the capsule of the kidney to the surrounding parts. In such a condition, the kidney is found embedded in a hardened mass, and when the organ is removed, its capsule is commonly left behind. The majority of the causes mentioned above do, however, usually produce suppuration. The abscess may be of almost any size. The pus most frequently lies behind the kidney, with the organ intervening between the abscess and the peritoneum, but it may completely surround the kidney, and may in rare cases lie entirely between the kidney and the peritoneum. The pus is often fetid even if there be no communication with the bowels. The surroundings parts are congested and often show small hæmorrhages; they may in some cases contain masses of sloughy tissue.

Symptoms.—At the commencement the symptoms are variable; they may be acute or latent, obvious or not well pronounced. They may again be masked by the symptoms of the primary disorder which causes the perinephritis. The earliest symptom is pain in the lumbar region of one side, uncertain in character, but usually dull, aching and deep seated, often shooting down to the inner side of the thigh, and sometimes accompanied by retraction of the testicle. The pain may, however, be paroxysmal, may disappear for a time and afterwards recur, and may be reflected even to the knee of the same side, as occurs in disease of the hip-joint. At the same time there is tenderness on deep pressure in the renal region, and a sense of resistance is experienced by the examining hand. The patient, too, feels a heaviness in the same locality. The position of the patient is often characteristic. He assumes a fixedly bent position, inclining also somewhat towards the affected side, and on lying down the thigh on that side is maintained in the flexed position. In sitting, the weight of the body is thrown on to the opposite tuber ischii, and in walking lameness is observed from a similar tendency to throw the weight on to the opposite leg. These constrained attitudes are due to attempts to avoid the pressure or strain upon the inflamed parts in the loin which would result from the contrac-

tion of the psoas muscle. There are at the same time the constitutional symptoms of the sub-febrile condition; a temperature slightly and irregularly raised, slight rigors, and coated tongue. The urine is febrile, and may contain a little albumen; it may also, of course, present the changes characteristic of the affection causing the perinephritis; the bowels are constipated.

Such are the symptoms of perinephritis without suppuration. When pus forms the pain and also the constitutional symptoms are increased in severity. Rigors and sweating are now pronounced features, and a more or less definite tumour appears in the loins, obscurely fluctuating and sometimes attaining a great size. The skin over the part may be œdematous, and may also be reddened. Nieten and Morris have each related a case where œdema of the lower extremity was an early sign of pus formation.

In the early stages, before pus has formed, the inflammation may undergo resolution and spontaneous cure.

When pus has once formed, unless it be liberated early, it will burrow in various directions. Most frequently it makes its way upwards, bursting into the pleura, causing empyema, or discharging itself directly into the bronchi, or else proceeds downwards in the sheath of the psoas muscle, showing itself at the groin. It may also, though more rarely, reach the cellular tissue of the iliac fossa, or of the pelvis, and may make its exit at Poupart's ligament, or at one or other of the foramina of the pelvis, or may burst into the vagina or bladder. Again, the pus sometimes finds an entrance into the large bowel, or bursts into the peritoneum; it may make its way through the kidney to the renal pelvis and the ureter, and, finally, it may open externally in the loins. By taking the latter course, the abscess finds a communication between the interior of the kidney and the external surface, by which portions of a calculus may be discharged. The fistula so produced may remain patent for years.

Diagnosis.—The symptoms may, especially in the early stages, be mistaken for those of disease of the hip-joint. The unilateral pain sometimes shooting to the knee, the flexure of the thigh and the bend of the body are similar in the two disorders, but in perinephritis the pain and tenderness are situated higher up. There is no pain on pressure over the trochanter or head of the femur,

passive movements of the hip-joint are painless when the limb is flexed so as to relax the psoas muscle, and there is no alteration in the length of the limb. Disease of the vertebræ, too, may be closely simulated, especially if the pus formed in a case of perinephritis have burrowed in the psoas muscle. But in perinephritis the body is inclined to one side, more or less, and is not held so stiffly as in caries of the vertebræ. Also there is distinct lameness, not merely tenderness of gait, there is no prominence of the vertebral spines, no bilaterally radiating pains, and no tenderness over the vertebræ. Moreover, the pain of vertebral caries is greatly relieved by suspension.

The symptoms and even the signs of typhlitis and perityphlitis closely resemble those of perinephritis of the right side. The diagnosis may be made by remembering that pain and swelling of perinephritis are higher in situation than are those of typhlitis, although in the further course of the two disorders the distinction may disappear. Vomiting is more common, and peritonitis occurs earlier in typhlitis than in perinephritis. Tumours of the kidney, lumbago, and fecal accumulations may possibly be mistaken for perinephritis; but their diagnosis will be clear from the account of the symptoms of perinephritis already given.

Prognosis.—If no pus have formed, the prognosis is favourable; but cases are rare which go on for any length of time without suppuration. Primary perinephritis, if recognized early, and the pus liberated by free incision, admits of a favourable prognosis. In all other cases the prognosis is grave. Death takes place from exhaustive suppuration, from pressure, or from severe peritonitis, pleurisy or pneumonia. Much depends, however, on early diagnosis and prompt liberation of pus. Even then, as a rule, the disease pursues a long and wearisome course.

Treatment.—In the early stages the measures recommended for abscess of the kidney (*q.v.*) should be adopted. Rest in bed and light diet, warm fomentations and poultices, and cupping or leeches to the loins. The bowels should be kept open after a preliminary purgation. As soon as pus is detected it must be at once liberated by lumbar incision, and search should be made for it by the aspirator if there be even a suspicion of its presence. The further treatment should be based upon the ordinary rules of surgery.

ROBERT MAGUIRE.

PERITONEUM, MALIGNANT DISEASE OF.—Malignant disease of the peritoneum may occur as a primary affection, but it is more commonly secondary to cancer of the abdominal viscera. The primary growth is situated with greatest frequency in the stomach and ovaries, and next in the uterus and pancreas, but it may be found in the rectum, large or small intestine, the testicle or the liver.

Symptoms.—The general symptoms are indefinite; abdominal uneasiness, nausea, diarrhoea, or alternating constipation and diarrhoea may first attract the patient's attention. If peritonitis occur there may be some fever. Ascites is one of the most constant symptoms, the effused fluid being generally of a brown or red colour, and at times containing so much blood that coagula form. Nodules, or tracts of induration of the omentum may be made out, or the primary tumour may be discovered. In a considerable number of cases a hard nodule may be found in the skin and subcutaneous tissues immediately about the umbilicus, produced probably by extension of the growth along the obliterated umbilical vessels. In colloid cancer the dense gelatinous masses which fill up the peritoneal cavity, and which are particularly apt to develop in the pelvis and the hypogastric and iliac regions, produce very great distension of the abdomen and absolute dulness. In these cases, especially towards their termination, the temperature is often remarkably depressed, and the patient is liable to shivering attacks with great coldness of the extremities, presenting a general resemblance to rigors, but without any elevation of temperature.

The *diagnosis* is often extremely difficult; when a malignant tumour of the stomach, ovary, or other organ is known to exist, the occurrence of ascites must excite the suspicion that the peritoneum has become secondarily affected, a surmise which will be strengthened, but not conclusively established, if the ascitic fluid be found to be blood-stained. The resemblance to tubercle of the peritoneum will be noticed. The age of the patient, and the absence of pyrexia, together with the nature of the primary lesion, if that can be discovered, will assist the diagnosis.

The *prognosis* is necessarily fatal, but the duration of the affection varies in different cases in relation with the rate of growth of the malignant tissue.

Pathology.—Peritoneal cancer may consist of a single tumour, or it may be limited to the pelvis. In typical cases of generalized peritoneal cancer, a large number of roundish or flattened granules or small tumours are stretched over the peritoneum, and present some resemblance in distribution to tuberculosis. The smallest of the tumours are, as a rule, not less than peas in size, and the majority are larger. As they increase in size the centre undergoes degeneration, and gives to the finger a sensation of softness, so that each growth is at a late stage umbilicated. At the periphery each nodule throws out processes, as it were, which tend to contract so that the serous membrane is dragged in towards the nodule; in this way the omentum is puckered up until it forms a solid mass lying transversely below the stomach; and the mesentery is thickened, indurated, and retracted; in this way also the calibre of the intestine may be greatly diminished and obstruction produced.

This description applies to hard carcinoma; soft carcinoma also occurs, but more rarely; multiple tumours commonly exist, but in the early stage are more globular, or even pedunculated, and tend later on to form large tumours.

Colloid Cancer of the Peritoneum is a distinct clinical variety produced by colloid degeneration of a true carcinoma. In its early stage it forms gelatinous nodules irregularly distributed; these quickly involve the submucous tissue and grow with great rapidity, coalescing with other nodules until the whole, or a large part, of the peritoneal cavity is filled up, and distended by soft gelatinous growth.

Sarcoma is, in most cases, secondary to gastric sarcoma. Lymphadenoma may spread from the retro-peritoneal glands along the mesentery, causing great thickening of the peritoneum and sub-peritoneal tissue; when the growth has completely surrounded the intestine, it does not produce contraction but converts the gut into a thick-walled rigid cylinder; the stomach may be similarly affected. The peritoneum is also liable to become the seat of papillomatous growths, secondary to rupture of papillomatous cysts originating in the parovarium or hilum of the ovary; these growths "are very liable to infect the whole peritoneal cavity, exhibiting the most malignant tendencies" (Doran), but in other cases they are not distinctly malignant.

Malignant disease of the peritoneum spreads in several ways: the multiple nodules probably originate by lymphatic infection, and subsequently extend by continuity of tissue. Cancer may also extend from the one to the other of two opposing surfaces of the peritoneum without the previous production of adhesions. Finally, it seems probable that portions of growth may become detached and find their way into the pelvis or other dependent parts and there set up the cancerous process.

Cancer of the peritoneum may be accompanied by peritonitis leading to adhesions between opposing surfaces, or to effusion of fluid which may be puriform. The ascites, however, must not always be attributed to this cause; it may be due to interference with the portal circulation by pressure of the new growths.

Etiology.—The disease is seldom or never observed below 30 years of age, is most common between 50 and 60, and is not uncommon at a later age. It is more often met with in women than in men.

The *treatment* can only be palliative; opium is the drug which may be given with greatest advantage, and no hesitation need be felt in administering doses sufficiently large and frequent to relieve discomfort and pain. Localized pain should be treated by fomentations, or leeches; diarrhoea by ordinary astringent remedies, and constipation by a mild laxative—preferably castor oil.

DAWSON WILLIAMS.

PERITONITIS.—Inflammation of the peritoneum may be acute or chronic, general or local.

Acute Peritonitis presents a complex of symptoms liable, especially in the early stage, to considerable variation, in accordance with the cause.

Symptoms.—In a case in which the early symptoms are not masked by some concurrent malady, such as enteric fever, the first to be observed is often a sudden rigor, or there may be vomiting, or purging, or both. Abdominal pain quickly becomes the most prominent symptom; it is generally referred at first to the hypogastric region, and the patient in sitting or standing remains rigidly bent forward. Being soon compelled to take to bed, he there assumes a characteristic attitude: he lies on his back with his shoulders raised, and knees and hips flexed; this position is assumed to relieve the abdominal pain, which is aggra-

vated by the erect or extended posture and by any movement or pressure of the abdominal muscles. For the same reason diaphragmatic respiration is abolished, breathing being mainly upper thoracic. The pain is sharp, cutting or darting, and has a burning character; there is also great tenderness, so that even the pressure of the bed-clothes is dreaded. The face is flushed, the features pinched, the eyes sunken and the expression anxious. The pulse is sharp, small, hard, wiry, and increased in frequency (100 to 150). The temperature is raised, commonly to 100° or 101° F., but it may reach 104° or 105° F. The skin is hot and dry, the tongue often furred and dry, thirst is distressing, and appetite is abolished. Vomiting is not uncommon, and it is, indeed, the rule for all food to be thus rejected. Owing to the abdominal movements, vomiting may cause great distress. Constipation is the rule, but there may be diarrhoea.

On examination of the abdomen it will be found to be exquisitely tender to the lightest touch, while deep pressure is insupportable. The abdominal muscles are rigidly contracted, so that in the very earliest stage the abdomen may appear a little retracted; later, however, more or less distension occurs, due either to gas in the intestines or fluid in the peritoneal cavity, or to both causes; when extreme, it seriously increases the existing embarrassment of respiration. Occasionally peritoneal friction may, in the early stage, be detected, either by palpation or auscultation. When fluid has collected, dulness may be detectable in dependent situations, but fluid may be masked by the flatulent distension of the intestines; for the same reason the areas of hepatic and splenic dulness are diminished. Ineffectual intestinal peristalsis may be perceptible to the eye or hand. The urine is scanty, high coloured, and deposits abundance of urates. Where the peritonitis is mainly pelvic, frequent and painful micturition may be a troublesome symptom, and is often succeeded by retention due to paralysis of the bladder.

Peritonitis from *perforation* or rupture is one of the commonest, as it is one of the most fatal, forms of the disease. The patient may be, apparently, in good health up to the moment when he is seized with sudden intense pain in the region of the lacerated organ—most often the stomach. The pain is accompanied by extreme collapse, evidenced by coldness of the surface, cold sweats,

and a small or almost imperceptible pulse. The symptoms, however, are not always so well marked, and may be entirely masked. This is especially the case in perforation of the intestine in the third or fourth week of enteric fever. In such cases it may only be possible to surmise the occurrence of perforation from the rapid fall of temperature and increased prostration, weaker pulse, cold extremities, the onset or increase of tympanites, and the presence of general abdominal tenderness. When air is present in the peritoneal cavity it tends to collect between the liver and diaphragm and abdominal wall, the result being a displacement of the liver backwards, and *obliteration of the hepatic dulness*, which thus becomes an important physical sign of perforation of the stomach or intestine. It must, however, be remembered that gas is occasionally, although probably very rarely, formed within the peritoneal cavity independent of perforation of the bowel.

Course.—Acute peritonitis terminates in death, recovery, or chronic peritonitis. In favourable cases the temperature and pulse fall, the pain and tenderness diminish, the respirations become natural, and the patient slowly recovers. In unfavourable cases the distension of the abdomen increases, whilst persistent vomiting and hiccough contribute to exhaust the patient's strength. The tongue becomes small, irritable, red at the tip and edges or all over, and tends to become dry. Sordes form on the lips, the face gets somewhat cyanosed, the eyes sunken and haggard, and pulse and respiration still more hurried. The whole aspect of the patient as he lies doubled up in bed, with anxious face, distended abdomen, dreading every movement, is now exceedingly characteristic. Death may ensue during this stage while the temperature is high; more commonly it is preceded by a fall of temperature, often to below the normal, and a sudden cessation of pain. The last-named phenomenon is of very bad omen; it appears to be a part of the general condition of collapse into which the patient has sunk. The pulse is so feeble, rapid and irregular as to be, perhaps, uncountable; the extremities are cold, the face pinched and blue, the respirations shallow and hurried, the voice a whisper. As a rule, the mind remains clear, but death may be preceded by coma, or by low muttering delirium.

Acute peritonitis has hitherto been considered as a general inflammation of

the peritoneum, but it may be limited to any part. *Local* or *circumscribed* peritonitis is always secondary to injury or visceral disease, and the symptoms of peritonitis are often masked by those of the primary malady. Circumscribed peritonitis is most commonly met with in the pelvis in association with inflammatory diseases of the uterus, Fallopian tubes (*q.v.*), ovaries or rectum: in the right iliac fossa in association with ulceration of the appendix and cæcum (*see* PERITYPHLITIS): in the right hypochondrium in association with abscess of the liver or gastric ulcer: and in the left hypochondrium in association with disease of the spleen or with gastric ulcer. The symptoms are the same in kind as those of acute general peritonitis, but vary in severity; cases of every degree may be met with, from the fully developed attack to instances in which the occurrence of circumscribed peritoneal suppuration is only discovered after death. The physical signs are limited to the affected region; pain and tenderness are localized, and probably a firm swelling with ill-defined edges will after a short time be discoverable. When suppuration has occurred fluctuation may be obtained.

In some cases the fluid effused into the peritoneum becomes blood-stained; this may be due to a very acute form of inflammation at the onset, or, at a later stage, to rupture of newly formed vessels in the false membranes.

The symptoms of **Chronic Peritonitis** are not well defined. Tenderness with uncomfortable dragging sensations, or pain aggravated by movement, may be referred to some part of the abdomen. Attacks of colic are common, and are especially liable to follow the taking of food. Appetite is impaired; constipation is commonly present, but may alternate with diarrhoea. When not due to tuberculosis, there may be no pyrexia, and all the symptoms may easily be attributed to dyspepsia. Physical examination may reveal the presence of fluid in the abdomen, but, as this may be confined by adhesions, the dullness may not shift with position. Irregular thickenings and a peculiar doughy feeling may be discovered on palpation.

The *diagnosis* of peritonitis sometimes presents great difficulties; this is especially the case for the first few hours in perforative peritonitis, during which period, moreover, death may occur. The difficulty of diagnosing peritonitis due to perforation of a typhoid ulcer has

already been mentioned. In simple colic and in lead colic the pain is intermittent or at least varies in intensity, and is relieved by pressure; the belly is generally hard and retracted, and the patient is restless. In colic complicated by hysteria the simulation of peritonitis may be closer, but the tenderness is mainly superficial, is not aggravated by deep pressure, and is not constant. Colic is said sometimes to cause a slight rise in temperature, but it would be imprudent to rely on so rare an occurrence as a guide to treatment.

The *prognosis* of acute peritonitis depends largely upon the nature of the exciting cause. Peritonitis produced by perforation of the stomach or duodenum may be fatal within two days and perforation of the intestine occurring during typhoid fever always, or almost always, causes death. Acute peritonitis is ill borne by young children, and is so serious a disease at all ages that the prognosis is always grave unless the inflammation be distinctly limited. During the progress of a case unfavourable symptoms are, change in the character of the pulse, which becomes soft, feeble, and faster; great abdominal distension; restlessness; sudden or rapid subsidence of pain without corresponding improvement in other symptoms; hiccough and the onset of collapse.

The *pathology* of the vast majority of cases of peritonitis is simple, the inflammation being due to the direct action of some irritant. In acute general peritonitis the primary lesion is more often situated in a hollow, than in a solid viscus, for perforation of the stomach, intestine or gall-bladder leads to extravasation of material which is not only irritant, but capable of producing sepsis. The same remark applies to the peritonitis which occurs as a consequence of parturition, the inflammation of the peritoneum being due to extension of suppuration from the septic cavity of the uterus. Salpingitis is another cause of purulent peritonitis, which may be in some cases septic, but is in others gonorrhœal. Septic peritonitis may also be originated by decomposition occurring in a hernial sac. Peritonitis due to intestinal obstruction is at first circumscribed, but may become general. Inflammation of solid viscera is less liable to produce general peritonitis, but circumscribed peritonitis is a common complication of hepatitis and ovaritis. General suppurative peritonitis may be due to rupture of an hepatic abscess or

of a splenic abscess (due to suppurating infarct), to rupture of a psoas abscess or of an hydatid cyst, or to suppurative nephritis. Pyæmic peritonitis probably always arises by secondary extension from local mischief. Peritonitis, generally suppurative, is a not very infrequent complication of chronic Bright's disease, occurring with the variety of kidney known as the "large white." Instances in which acute peritonitis was apparently due to sewer gas have been reported, and many believe that the disease may be produced by exposure to cold; to such cases the term idiopathic peritonitis is applied. The peritoneum may also become inflamed by extension from the pleura and pericardium; this is especially liable to occur in children, and the inflammation is commonly suppurative. Children also appear to be specially liable to sub-acute general peritonitis accompanied by more or less effusion. Some of these cases are undoubtedly tubercular, but the pathology of others is obscure, the patients recovering without surgical interference. Severe blows, even if no organ be ruptured, may determine peritonitis. The collapse and cardiac disturbance are reflex, being produced by the irritation of the peritoneum, and the hurried respiration may be in part due to the same cause.

Chronic peritonitis appears to be most commonly the result of one or more attacks of acute peritonitis, or of extension from localized acute peritonitis which has subsided; it may be limited to, and associated with, chronic disease of the liver, spleen or other viscera. It is a frequent accompaniment of tubercle and less often of cancer. In some cases it appears to arise spontaneously, the first symptom to attract attention to the belly being its increased dimensions, which are found to be due to ascites. Limited chronic plastic peritonitis appears generally to follow tapping for ascites due to cirrhosis of the liver.

The *morbid anatomy* of all cases of peritonitis is fundamentally the same, but the appearances vary greatly with the intensity and character of the inflammation. The earliest changes are dilatation of the small vessels, infiltration of the sub-serous tissue, and epithelial proliferation. Inflammatory redness is apt to be limited to two narrow longitudinal bands, parallel with, and about equidistant from, the mesenteric attachment. Exudation now takes place at the surface. This exudation may be (a) plastic, leading to the formation of a greyish lamina con-

sisting of fibrinous material enclosing cells; or (b) fluid, containing more or less numerous pus cells. Peritonitis produced by blows, and circumscribed and chronic peritonitis tend to plastic exudation, and in this way a small collection of pus may be shut off from the general cavity of the peritoneum. Even in cases where perforation of a typhoid ulcer has occurred it is not unusual to find only a small area of suppurative peritonitis, limited in all directions by plastic adhesions between the intestinal coils. In general peritonitis of the plastic type the false membranes may become enormously thickened. If the acute process subside early, organization of the false membrane occurs, and adjoining organs become firmly adherent; in this way a large part or the whole of the peritoneal cavity may be obliterated. If the exudation be fluid, the peritoneal surface, instead of becoming dull and lustreless, owing to the layer of lymph, remains glossy and becomes greasy to the touch; the fluid may be of any degree of corpuscular richness.

Every gradation between well-marked plastic and well-marked suppurative peritonitis may be met with, but, as a general rule, when the fluid is distinctly purulent, the plastic effusion is limited. In circumscribed peritonitis a collection of pus may be contained within a cavity lined and formed by organizing lymph.

Adhesions the result of acute peritonitis, if limited in extent, may become gradually lengthened, forming bands under which gut may pass and become strangulated; or a coil of intestine may be so fixed that a kink is produced, which may eventually determine an attack of obstruction. Chronic peritonitis when not due to tubercle is generally plastic, with but little effusion, and that serous. When the intestines are involved, their coils may be almost universally adherent to each other, and retracted into a single mass against the spine; or the peritonitis may chiefly affect the mesentery, diminishing its area in every direction, so that the intestine is much shortened and moored down to the vertebral column, although the coils may not be adherent to each other.

Treatment of Acute Peritonitis.—The first indication is usually held to be to procure general and local rest. The patient should be put to bed and propped in the attitude which is found most comfortable. The only drug of any proved value is opium; it should be given at once in full doses. Two grains of opium,

or its equivalent in laudanum, should be given every two or three hours, and the patient carefully watched, relief of pain being taken as an indication to diminish, but not to stop, the opium; its administration should be continued even after danger has apparently passed. The existence of constipation or of intestinal obstruction is not a contra-indication; on the contrary, its effect in acute obstruction has led to the paradoxical statement that "opium is a purgative." Morphine may be administered hypodermically. Purgatives should not be given under any circumstances. No solid food must be allowed, and, if vomiting be troublesome, nothing beyond a little ice should be taken by the mouth. Nutrient enemata or suppositories may be used if thought necessary. Local depletion by leeches (ten to thirty) is strongly recommended by some in the early stage of acute peritonitis in robust individuals. Warm local applications are most generally used, but flannels dipped in ice-water are said to allay pain and anxiety and to limit inflammation. Depression is to be combated by diffusible stimulants, of which the best are good brandy, champagne, ether, or ammonia and quinine. Stimulants should not be given as a part of routine treatment. Flatulent distension is not easily relieved; turpentine stupes may be tried, or small turpentine clysters, or the cautious introduction of the long rectal tube. If the distension be seriously interfering with respiration, and other means of relief fail, puncture of the intestines with a fine trocar may give relief. Hiccough, if not checked by opium, may be relieved by ether, by the combination of camphor with opium, by sinapisms to the epigastrium, by a small blister in the same situation, the resulting sore being dressed with morphine. Strong coffee, combined with a large dose of bromide of ammonium, may succeed, but the symptom is sometimes so intractable and causes so much pain and distress that it is necessary to resort to the inhalation of chloroform.

If the peritonitis be due to perforation of a gastric ulcer, the injunction to allow nothing, whether food or drug, by the mouth need hardly be given. In such cases, and in suppurative peritonitis due to disease of the pelvic organs, or to the rupture of a hydatid cyst or abscess, the question of performing abdominal section may be raised. At present the cases in which primary laparotomy has been performed with the object of treating per-

forative peritonitis are too few to allow of a definite opinion being here expressed.

Treatment of Acute Circumscribed Peritonitis.—This does not differ from that above detailed; the main anxiety is to prevent the inflammation from becoming general.

In *chronic peritonitis* a flannel roller carefully applied favours absorption and preserves from cold. Careful manipulation of the abdomen (massage) is believed to favour absorption of fluid and to relieve constipation. Ascites is better treated by the Turkish bath, or even by tapping, than by purgation; repeated tapping may end by greatly improving the patient's condition owing to obliteration of the cavity in which the fluid accumulated. Where local tenderness can be made out, counter-irritants, such as iodine, should be used.

DAWSON WILLIAMS.

PERITONITIS, TUBERCULAR.—There are several distinct clinical forms of this affection. (1) The peritoneum may share in a general acute-miliary tuberculosis affecting the meninges, the lungs and the abdominal viscera, and, to quote the words of Dr. Hilton Fagge, "it is often almost an accident whether a case should be regarded during life as one of tubercular meningitis, or tubercular peritonitis, or of miliary tuberculosis of the lungs." (2) The peritoneum is sometimes affected by tuberculosis which is limited to the serous membranes of the pleura, pericardium and peritoneum. (3) The peritoneum may be secondarily infected by direct continuity from tubercular ulcers of the intestine (*q.v.*), over areas which are, at first at least, limited. (4) The tubercular process may apparently originate in the peritoneum, and being accompanied by inflammation, gives rise to the condition known as tubercular peritonitis.

Tubercular peritonitis is a term commonly reserved for cases in which the affection of the peritoneum is well marked. Such cases present features which entitle them to be placed in a special clinical class. The aetiology of the condition is obscure; as observed in the dead-house it is often accompanied by intestinal tubercle, but whether as cause or effect is not clear. The lungs are affected in seven cases out of nine (Fagge), probably secondarily. The Fallopian tubes are frequently affected, sometimes perhaps primarily. It is more frequently observed in children

than adults,* though not rare in the latter.

Symptoms.—The onset is insidious; abdominal fulness, pain and tenderness, with slight evening pyrexia, wasting and general impairment of health and activity are early symptoms. Pain and tenderness may be absent, and there is not often evidence of ascites, the fulness being due to gaseous distension of the intestines. Later the pain becomes greater, and occurs in paroxysms; constipation and diarrhoea alternate; fluid may be detectable in the abdomen, and the thickened omentum, or the cords of lymph which fix the intestines together and lie in the grooves between them, may be felt. Tension of the parietes is, however, often considerable and interferes with palpation. Emaciation progresses rapidly in the later stages, the child becomes confined to bed, the face is pinched and anxious, abdominal pain is severe; tenderness is extreme and the legs are drawn up; the pyrexial excursions become higher (104° F.), the pulse rapid, the tongue dry, red and tremulous, and the lips covered with sordes. Death may be due to exhaustion, hastened often by intercurrent pulmonary disease. In children meningitis is very common.

Not infrequently the disease appears to become arrested and this arrest may be permanent even after symptoms have existed for many months or even years; more frequently relapse occurs: arrest, partial recovery and relapse may recur several times and the patient finally recover. Not infrequently inflammation extends along the track of the obliterated umbilical vessels leading to an erysipelatous redness about the umbilicus which may end in an abscess which discharges externally; occasionally a fistulous communication is established with the peritoneal cavity, which is thus emptied. It is stated that where the distension is very great the umbilicus may give way without previous inflammation.

Course.—Though usually a chronic malady, it occasionally runs an acute course lasting only four weeks.

Diagnosis in the early stage is extremely difficult; abdominal pain and

distension, with diarrhoea and wasting, may be due to imperfect digestion, but if to these symptoms be added distinct abdominal tenderness evidenced especially by the care which the patient takes to avoid a blow, or even a slight jar, the case will be looked on with suspicion and systematic observation may reveal slight nocturnal rise of temperature. Later this dread of any sudden movement or jar gives the patient a rather characteristic aspect.

Acute cases, and to a lesser degree chronic cases during periods of exacerbation, are liable to be confounded with enteric fever. The absence of rash and of enlargement of the spleen, and the more irregular character of the pyrexia will be of use in distinguishing the acute cases from enteric fever. In more chronic cases the history of the case, especially the duration of the illness, will assist the diagnosis. The discovery of fluid in the pleura will also be confirmatory as it points to tubercular pleurisy. In women amenorrhœa is a suspicious symptom as it may be due to tubercular salpingitis; the same may be said of chronic epididymitis and orchitis in men.

Erysipelatous redness about the umbilicus, sometimes ending in abscess, is a characteristic occurrence due to extension of inflammation along the obliterated umbilical vessels. The discovery of the thickened omentum, which must not be confounded with the edge of the liver, or of bands or nodules of lymph, will leave little room for doubt in the later stages.

Morbid Anatomy.—The extent of surface affected varies greatly; sometimes the under surface of the diaphragm and the flanks are most affected, but in the most typical cases the intestinal serous membrane is thickly set with tubercles, and the several coils of intestine are glued together by lymph. Fluid may be contained only in small pockets or there may be a large quantity of fluid in the peritoneal cavity, the intestines being matted together and packed back against the posterior wall of the abdomen. The fluid may be serous or purulent, and is sometimes blood-stained. The omentum is generally affected, forming a thick, and often very large, flattened mass; thick layers of lymph may overlay the intestines and other abdominal organs, or the solid effusion may be chiefly collected in the grooves formed by the adjacent coils of adherent intestine.

Treatment.—Rest in bed, regulated

* Dr. Fagge's statistics ("Principles and Practice of Medicine," 1886, vol. ii. p. 428) probably contain some fallacies. In 28 consecutive fatal cases 2 were under 10 years, 6 from 10 to 20, 8 from 20 to 30, 5 from 30 to 40, 3 from 40 to 50, and 4 over 50; he also states that the disease is more than twice as common in men as in women.

diet, opium to control pain. combined with bismuth if diarrhoea be present, are amongst the most important measures. Counter-irritation is recommended by many writers. Henech advises the daily use of tincture of iodine to one quarter of the abdominal surface; the application may be continued for weeks: Alonzo Clark recommends a solution of iodine in olive oil (gr. viij or x or even xxx to 3j) rubbed in twice a day and covered with oil silk. Mercurial applications are reported to cure "the great majority of cases" admitted into Guy's Hospital; Dr. Fagge recommended linimentum hydrargyri spread freely over the surface of a flannel belt stitched tightly round the abdomen; Dr. Goodhart prefers to have the abdomen painted with oleate of mercury, or the following:—R Ung. hydrarg. 3j, ext. bellad. 3j, glycerin. 3j, ol. olivæ ad 3ij. The application of belladonna and glycerin (equal parts) is useful in relieving pain. In the early stage or during remissions, a residence at the seaside, and the administration of cod-liver oil are important measures in treatment. The syrup of the iodide of iron is supposed to be specially useful, and may be given when cod-liver oil cannot be digested.

Laparotomy and washing out of the peritoneal cavity have been followed by recovery, which was apparently complete and permanent; in future therefore the desirability of resorting to this heroic treatment must be considered in every case. It is said that cases in which spontaneous evacuation at the umbilicus occurs yield a large percentage of recoveries.

DAWSON WILLIAMS.

PERITYPHLITIS AND TYPHLITIS (Inflammation of the Appendix Cæci).—By the former is to be understood inflammation around or outside of the cæcum; by the latter, inflammation of the cæcum itself. As the two conditions generally co-exist and cannot be separated from each other clinically, it will be convenient to describe them together.

Symptoms and Diagnosis.—The disease is generally ushered in by an attack of constipation, alternating, it may be, with diarrhoea; and this is followed by pain in the right iliac fossa, and often by vomiting. Not a few cases occur in which the symptoms are practically those of intestinal obstruction. On examining the seat of pain there is found an elongated swelling, commencing in the right iliac region and extending for

some distance up the colon. This swelling gives a dull note on percussion, and is very tender to the touch. There is also a class of cases, and those the worst, in which no tumour may be felt, and the symptoms are those of acute peritonitis. The right thigh is flexed as the patient lies in bed, so as to diminish the tension of the abdominal wall; and in cases which have commenced acutely the temperature is raised to the extent of two or three degrees, or perhaps more. There is loss of appetite also, and the tongue is coated, of a brownish tint down the centre, and dry. As might be expected, thirst is often complained of, and the urine is small in quantity, high coloured, and often contains indican.

In typical cases the diagnosis presents no difficulty. Although there are other diseased conditions which show points of resemblance with typhlitis, there are also points of difference sufficient to guide the observer to a correct conclusion. Cancer of the cæcum may be mentioned as one of these. Here the chronicity of the complaint, the age of the patient, the history of the symptoms, and the emaciation will help to establish the differential diagnosis. Enteric fever, also, by the pain and tenderness in the right iliac fossa, the appearance of the tongue, and tumidity of the abdomen may suggest typhlitis; but a careful inquiry into the history, the range of temperature, and the absence of swelling will serve to make the distinction. Intussusception will be negatived by the less urgent nature of the symptoms and by the absence of the passage of mucus and blood characteristic of that affection. Simple impaction of fæces, which occurs mostly in old people, may present the sausage-shaped swelling of typhlitis, but the general condition and the absence of pain and tenderness exclude the latter disease.

The graver class of cases above referred to, in which the symptoms are those of a general peritonitis, presents more difficulty, and here the diagnosis is established more by excluding other causes of peritonitis than by any positive physical signs. Whenever a sudden peritonitis becomes developed in a young person, and we can exclude injury and tubercle, mischief in the vermiform appendix may be fairly suspected.

Prognosis.—In cases in which the iliac tumour is marked and the development of the disease is gradual, the prognosis is very favourable. In the more severe cases, characterized by rapid onset and

peritonitis, it is necessarily very grave. If the peritonitis be only local, good hope may be entertained of a favourable result with prompt surgical treatment; but where the original mischief is not hemmed in by adhesions, and rapidly spreading peritonitis occurs, the case is likely to end in death at no long interval. And even where recovery occurs relapses are very common.

Ætiology.—Perityphlitis and typhlitis occur most frequently in the young, and in the male sex more often than in the female. It is now generally acknowledged that, in the great majority of cases, if not, indeed, in all, the starting-point of the disease is to be found in the vermiform appendix. The anatomical condition of the appendix renders it especially prone to become a focus of disease. The feebleness of its muscular coat invites accumulation of faecal matter, and disables it from expelling such accumulation. This gradually becomes inspissated and acts as a foreign body, setting up an ulcerative process which may in time end in perforation. Short of this, however, inflammation may spread from the mucous to the serous coat of the appendix and to the cæcum itself, and this is probably the history of the frequently relapsing form of the disease. The appendix is also sometimes found bent at an acute angle and greatly distended with mucus, and in this condition it presents a source of irritation which may at any time light up an attack of typhlitis. It should be noted, also, that the appendix is sometimes the seat of tubercular, and sometimes of typhoid, ulceration. Foreign bodies, too, have been found in it, although by no means so frequently as used to be thought, the inspissated concretions of faecal matter before referred to being, no doubt, often mistaken for date- or cherry-stones. It is doubtful whether simple faecal accumulation in the cæcum ever leads to typhlitis; it is more probable that the accumulation is a result of the inflammatory process, which at first beginning in the appendix, affects by extension the walls of the cæcum, inducing paralysis of the muscular coat.

Pathology and Morbid Anatomy.—Even before perforation of the appendix has taken place, and all the more after that event, peritonitis is set up. This may be local in the first place, and may continue so, or it may rapidly become general. In the former case adhesions take place by which the pus which is formed is hemmed in where it may re-

main for an indefinite time. In the latter, besides the ulcerated appendix, intense inflammation will be found in the cæcal region, with formation of pus and a general involvement of the whole peritoneal membrane. Or an abscess, at first localized, may be found to have burst into the general peritoneal cavity, or into the bladder, colon, rectum, or elsewhere in the abdomen. It may also burst through the abdominal parietes. A faecal concretion is, in the great majority of cases, found in the appendix or in the pus around it. In the last dozen cases of death from perforation of the vermiform appendix occurring in the Middlesex Hospital, the post-mortem records show that such concretions were found in nine. Death is usually due to peritonitis, but in exceptional cases to long-continued suppuration, inducing, it may be, albuminoid disease, or to septicæmia, as in a case reported by the writer in the "Clinical Society's Transactions" (vol. xviii. p. 16. 1885).

Treatment.—In the class of cases in which a well-marked tender swelling is found in the cæcal region, the vermiform appendix is probably but little affected, and the indications for treatment are simple enough. Strict rest in bed must be enjoined, with liquid diet and hot poultices or fomentations to the right iliac region. Under the hot applications, equal parts of extract of belladonna and glycerine on lint may be applied with advantage; or, if the pain be very severe, two or three leeches before poulticing. As regards drugs, opium is the sheet-anchor, on account of its power of alleviating pain and checking the peristaltic action of the bowels. It may be given in the form of pill ($\frac{1}{4}$ to 1 grain of the extract) every four or six hours, according to the age of the patient and the amount of pain; or the tincture may be substituted if preferred. If vomiting forbid medication by the mouth, the subcutaneous injection of morphine may be practised instead.

Above all, purgative medicines must on no account be employed. Many a patient has been done to death by purgatives, in whom an opposite plan of treatment would have been instrumental in saving life.

When the temperature has become normal and the pain and tenderness have passed off, the bowels should be moved by simple enemata. As regards diet, only slops should be allowed, and great caution is necessary during convalescence and for a long time after, as relapses are

apt to occur after the slightest indiscretion. The patient should be restricted to soups, milk, panadas and the like, for as long a period as possible. Treated thus, the disease almost uniformly ends favourably in resolution. If, however, in spite of treatment, the symptoms become aggravated and point to suppuration, an incision must be made and the pus evacuated, the parts being irrigated with a warm antiseptic solution and drained.

Where the presence of pus is suspected, it is advocated in America to explore with a needle. But this proceeding is attended with considerable risk, and it is safer and better to make an exploratory incision at once. The needle may get into adhesions and fail to reveal pus when it is really present.

In the more alarming class of cases where a sudden onset of severe pain with collapse and peritonitis indicates that perforation of the appendix has taken place, opium must be freely given, but prompt surgical intervention also is necessary to give the patient a chance for his life. DAVID W. FINLAY.

PHANTOM TUMOUR.—A localized swelling in the abdomen, peculiar to women. The swelling is tympanitic and tumid and unconnected with disease of any of the abdominal viscera. It is usually situated in the middle line below the umbilicus, and may vary much in size. It disappears completely under chloroform, to return even before the effect of the anæsthetic has entirely passed off. The cause of it is obscure, but it must be regarded as a manifestation of hysteria and treated accordingly.

PHARYNGITIS, ACUTE (Acute Pharyngeal Catarrh).—An acute inflammatory affection of the pharynx and adjacent parts.

Symptoms.—The patient usually complains of a frequent desire to swallow, but, has at first discomfort in so doing, soon passing on to pain. If the uvula be markedly enlarged there will be the sensation of a foreign body in the throat and probably a hacking cough, especially on lying down, from the uvula coming into contact with the back of the tongue or epiglottis. Extension of the inflammation downwards into the larynx will cause hoarseness; its extension upwards and forwards will lead to interference with nasal respiration and will consequently give a nasal twang to the voice.

The Eustachian tubes may be occluded, giving rise to a feeling of fullness in the ears and temporary deafness. There is usually some amount of stiffness and discomfort about the neck. As regards general symptoms, the attack is ushered in with a feeling of malaise, and chilliness sometimes amounting to rigors, and after a short time a rise in temperature occurs. The tongue is furred, there is loss of appetite, constipation and febrile urine. On inspection, the soft palate, uvula, tonsils and pharynx will be seen to be swollen and the surface covered with viscid mucus. The uvula at times attains the size of the thumb and may be cedematous — to this condition the term *uvulitis* has been applied (*see* UVULA).

Diagnosis.—A careful examination of the back of the throat should suffice to settle the nature of the malady.

Prognosis.—Simple catarrhal pharyngitis is usually an affair of a few days to a week, it is only when the inflammation is of an erysipelatous type that danger need be apprehended.

Pathology.—There is at first hyperæmia and swelling of the mucous membrane, with arrest of secretion, and then a viscid, muco-purulent fluid is poured out.

Ætiology.—A chill, especially in persons of the rheumatic diathesis, errors in diet, a sedentary life and a strumous inheritance predispose to pharyngitis, as they do to inflammatory affections of other mucous surfaces.

Treatment.—At the commencement 3 grains of calomel, followed by a saline aperient, are useful. If the temperature range high, minim doses of tincture of aconite every half-hour for two or three doses, and then at less frequent intervals, will have a good effect. Guaiacum has long been a favourite remedy in pharyngeal inflammation; it may be given in 5-grain doses mixed with jam every two or three hours, or the trochisci guaiaci of the Throat Hospital Pharmacopœia may be ordered. If the patient be at all below par, carbonate of ammonium in 10-grain doses with 15 grains of bicarbonate of sodium, given with 17 grains of citric acid while effervescing, will act as a stimulant. In cases of rheumatic origin, 10 or 15 grains of salicylate of sodium may be added to the mixture. Later on quinine is well borne. Locally, ice, both externally and internally, is to be preferred to warmth. Spraying the throat with a 10 per cent. solution of cocaine will facilitate deglutition if this be very painful.

F. DE HAVILLAND HALL

PHARYNGITIS, CHRONIC
(Chronic Pharyngeal Catarrh).—Chronic inflammation of the pharynx and adjacent parts.

The *symptoms* are those enumerated under the head of ACUTE PHARYNGITIS, but they are less severe. One of the most troublesome is the hawking and clearing of the throat necessitated by the presence of viscid mucus at the back of the pharynx; this may give rise to vomiting.

Diagnosis.—The relaxed condition of the mucous membrane, the presence of dilated venules and sticky mucus at the back of the throat are the characteristics of the disease.

Prognosis.—The affection is very troublesome and obstinate, but free from danger to life.

Pathology.—Briefly the changes present are chronic hyperæmia of the mucous membrane of the pharynx, with cell proliferation and dilatation of the small vessels of the part.

Etiology.—It may be the sequel of an acute attack, but the disease more commonly comes on gradually in persons leading sedentary lives in an unhealthy atmosphere, especially if there be excess in smoking and drinking. The strumous rheumatic and gouty diatheses predispose to the disease. Of late, attention has been directed to the dependence of chronic pharyngeal affections on obstructed or disordered nasal respiration. Atrophic rhinitis, for example, is almost invariably attended with a dry, glistening condition of the pharynx, to which the term *pharyngitis sicca* has been applied.

Treatment.—The essential points in the treatment of chronic pharyngeal catarrh are to combat, as far as possible, the constitutional causes which underlie it and to treat any nasal trouble which may exist. A tepid or cold sponge bath, with vigorous friction of the skin, wearing flannel next the skin, exercise in the open air, great moderation in the use of stimulants, leaving off smoking, avoidance of pepper, mustard, curry and other pungent articles of diet, will be of service. A gorged state of the pharynx is often found associated with piles; in these cases saline aperients will be found to act beneficially on both conditions. If there be any affection of the nose this must be treated as is directed under the head of RHINITIS. As regards local treatment, painting the throat with glycerin of tannin, or with an application composed of equal parts of tincture of iodine, tincture of catechu and

glycerin, may be tried. The medicated throat pastiles will be found a convenient mode of applying local remedies. Among the most valuable may be mentioned those of chlorate of potash and borax, rhatany and chloride of ammonium. If there be much irritation, the compound rhatany pastiles, which contain $\frac{1}{10}$ grain of hydrochlorate of cocaine, may be ordered. Gargles are of little use, sprays being more efficacious; any of the sprays mentioned for use in the treatment of chronic laryngitis may be employed with advantage in chronic pharyngitis. If the pharyngeal irritation be kept up by the presence of an elongated uvula, this must be removed.

F. DE HAVILLAND HALL.

PHARYNGITIS, GRANULAR
(Clergyman's Sore Throat).—A chronic form of pharyngitis characterized by the presence of granular bodies on the mucous membrane of the pharynx.

Symptoms.—The amount of discomfort the patient suffers is out of all proportion to the objective condition. A feeling of irritation is complained of, as though a foreign body were in the throat, there is also cough, but usually without expectoration. The voice is not at first affected, but sooner or later the individual finds that he must clear the throat before beginning to speak, and in course of time he finds that he cannot talk for long without clearing the throat, and eventually the voice becomes much impaired in consequence of the strain thrown on the larynx by the constant hawking. The mental effect must also be borne in mind, as patients are apt to imagine that they have some grave disorder of the throat, such as cancer or consumption, and are consequently subject to great depression.

The objective symptoms consist in the presence of roundish or oval prominences on the mucous membrane of the pharynx. They are of red colour and usually rather darker than the neighbouring mucous membrane; they vary in size from a pin's head to a pea, but by coalescence larger masses may be formed. The vessels of the pharynx are enlarged and a stellate arrangement is not uncommon.

Diagnosis.—The irregular granular condition of the pharynx and the chronicity of the symptoms are diagnostic of the disease.

Prognosis.—No danger is to be apprehended to life, but the disease is apt to be very chronic, and, until recently, treatment was not very successful.

Pathology.—The granules are due to a circumscribed proliferation of lymphatic tissue around the efferent ducts of the mucous glands; the pavement epithelium of the mucous membrane extends over the granule, though it is thinned, and may be absent over the top of it. In some instances the inflammatory process is limited to the lateral walls of the pharynx. To this condition the term *pharyngitis lateralis hypertrophica* has been applied. In such cases a round or flat swelling may be seen immediately behind the posterior pillar of the fauces. The swelling consists of a conglomeration of granulations, with more or less hypertrophy of the salpingo-pharyngeal fold.

Ætiology.—The causes which have been mentioned as producing chronic pharyngitis are also concerned in the production of granular pharyngitis, but the most powerful of all causes is undoubtedly over-use of the voice, especially under unfavourable circumstances, as, for instance, when the individual is suffering from catarrh, or in an impure atmosphere, or in the open air.

Treatment.—Though relief may be obtained by carrying out the measures suggested under CHRONIC PHARYNGITIS, the only hope of curing the patient consists in the destruction of these granules. For this purpose the galvano-cautery is by far the best form of caustic. Each granule must be touched with the galvano-caustic point or blade at a dull red heat; four or five applications can be made at a sitting. Any prominent vessels may be divided by applying the blade at right angles to them. If the throat be unusually irritable, it may be sprayed with a 10 per cent. solution of cocaine, but, as a rule, so little pain is experienced that this is unnecessary. The feeling of sore throat which follows is best relieved by effervescing lozenges containing chlorate of potash and cocaine, or by the compound rhatany pastiles already mentioned. Only in very exceptional cases does the amount of inflammatory reaction require the use of ice pills. The sittings should be at intervals of a week to ten days, and usually four or five suffice for the cauterization of all the granules. If this be thoroughly carried out, the result is most satisfactory, and there is but little tendency to a relapse. As regards general treatment, if the reflex irritability be excessive, bromide of potassium with a bitter infusion is indicated, but, as a rule, most improvement results from the administration of iron and arsenic. F. DE HAVILLAND HALL.

PHARYNX, ULCERATION OF.

—Ulceration may be met with as a result of syphilis, tuberculosis, lupus and malignant disease.

(a) **Syphilitic Ulceration.**—This is so much the most common that the possibility of the disease being due to syphilis should be excluded before any other diagnosis is arrived at. Syphilitic ulceration is generally due to the breaking down of a gumma, so that the ulcer is usually round or oval in shape, and is most often situated in the centre of the posterior wall of the pharynx, but in severe cases it may spread in all directions. After the ulcers heal, white cicatrices are left which give rise to contraction of the neighbouring parts. There is very little pain attending syphilitic ulceration.

Treatment.—This is as for syphilis generally. Locally, after the surface has been cleaned by a detergent spray, iodoform may be insufflated, or a solution of sulphate of copper (20 grains to the ounce) applied.

(b) **Tubercular Ulceration.**—Tubercular ulcers of the pharynx are lenticular in shape, with no apparent excavation; the base is pale yellow, the edges are irregular and ill-defined, and the surface covered with thin unhealthy pus. The presence of the tubercle bacillus will establish the diagnosis. Pain, which is almost absent in syphilitic ulceration, is a prominent symptom in the tubercular affection, and radiates to one or other ear; there is also great pain on deglutition. The remaining symptoms are those usually met with in tubercular disease of the larynx and lungs, with which the pharyngeal affection is almost invariably accompanied.

Treatment as for laryngeal tuberculosis.

(c) **Lupus of the Pharynx** is usually met with as an extension from lupus of the nose and of the pharynx.

For diagnosis and treatment, see LARYNX, LUPUS OF.

(d) **Cancer of the Pharynx** is generally of the scirrhus variety. It begins as a hard irregular mass, which subsequently softens and ulcerates. The marked induration of the edges and the fungous-looking surface will usually suffice to distinguish it from tertiary syphilitic ulceration. If there be any doubt, iodide of potassium in full doses will soon set it at rest.

F. DE HAVILLAND HALL.

PHLEGMASIA DOLENS.—A disease occurring chiefly in the puerperal

state. Its main characters are denoted by its name, "phlegmasia alba dolens" = "painful white œdema." It is due to obstruction of the veins and lymphatics of the part affected.

Clinical History.—The affection usually comes on towards the end of the second week after delivery, but the date of onset varies much. It begins with pain and fever, the pain being generally in the groin and upper part of the thigh of the affected side. Then comes swelling, which extends down over the whole limb and the corresponding labium. This rapidly increases, so that in a day or two the limb may be twice the size of the other. The pain may extend over the back and lower abdomen, and the whole of the affected limb. The pain and swelling in some cases begin in the foot and thence extend upwards. For the first two to four days the limb is tender, and the swelling pits. Then the swelling acquires the solid character that has been mentioned, and does not pit on pressure, nor when pricked does serum ooze out. The œdema is not altered by position; and there is more loss of power over the limb than is usual in ordinary œdema. This condition lasts from three to eight days. Then the swelling begins to get less hard, and to again pit on pressure, and about this time the pain, tenderness and febrile symptoms diminish. The swelling takes, as a rule, from three to five weeks to subside, but some amount of enlargement of the limb persists long after this date, and, if not treated, may be permanent. During the height of the pain and swelling there is some degree of numbness in the limb. The pain is often so severe as to prevent the patient from sleeping. There are seldom any signs of inflammation about the limb. The plugged veins may sometimes be felt as hard cords.

As a rule, phlegmasia dolens ends in recovery. The chief danger lies in the possible detachment of a clot, and its being carried into the heart, and thence into the pulmonary artery, thus causing pulmonary embolism (see PULMONARY ARTERY, EMBOLISM AND THROMBOSIS OF). This does not occur until a sufficient time after the formation of the clot to admit of its having softened and become friable, which is seldom until at least three weeks after delivery.

In rare cases the thrombosis extends up to the vena cava and thence to the heart, and in that way kills the patient.

Pathology.—Ordinary phlegmasia dolens, such as has been described, is

pathologically different from phlegmonous erysipelas of the cellular tissue, and from suppurate phlebitis and periphlebitis, although either of these conditions may exist along with it.

The statement that the veins are obstructed rests upon the fact that in every case in which the parts have been dissected the veins have been found plugged. That there is also obstruction to the return of lymph from the limb is inferred from the fact that the œdema, during the few days in which the disease is at its height, is of a peculiar solid, non-pitting character, such as is never seen from simple venous obstruction, but is seen in inflammation of the lymphatics, and in elephantiasis, a disease known to depend upon plugging of lymphatic vessels. In elephantiasis the change is more marked because the obstruction is permanent, while in phlegmasia dolens it is temporary. We do not know what is the cause of the venous thrombosis and lymphatic obstruction in phlegmasia dolens. There are very seldom signs of inflammation in the limb.

Ætiology.—The disease has been ascribed to a blood poison; but nothing is known about the poison, if there be one. It is most common in the puerperal state. It is seen occasionally in the terminal stages of phthisis and cancer, and still more rarely in other conditions of anæmia and debility. As a puerperal disease it is most apt to occur after labours that have been accompanied with hæmorrhage. Its frequency in the lying-in period is attributed to the combination at this time of slowness of the circulation with a varicose condition of the veins and an excess of fibrin in the blood. It is generally in one leg, and that more often the left, probably because the veins of the left side are more often varicose than those of the right. It may affect both legs, or even the arms.

Treatment consists in absolute recumbency so long as the pitting œdema is present. During the febrile symptoms diet must be regulated according to the patient's digestive powers. For the relief of pain local applications are best, but these should not be of an irritating character, and should not involve friction. Lint smeared with ext. bellad. and glycerin, p. æq., laid on the limb is useful. If pain be severe, a 4 per cent. solution of oleate of morphine in olive oil may be painted on the limb. The limb should be slightly raised to favour the return of blood from it, the pressure of

the bed-clothes taken off by a cradle, and, unless the weather be warm, the limb wrapped in cotton-wool. After the sixth week, if oedema be slow in subsiding, the limb may be bandaged from the toes upwards with a Martin's perforated india-rubber bandage, put on before the patient rises from bed. The patient and her friends should be most strictly cautioned against friction or kneading of the limb—measures which they are very likely to think useful.

G. E. HERMAN.

PHOSPHATURIA.—A condition in which an excess of phosphates is passed in the urine.

This must not be confused with a mere deposition of phosphates from the urine. Such a phenomenon is merely a sign of alkalescence of the urine, and may take place when a normal, or even a less than normal, quantity of phosphates is present. Nevertheless, it was this latter condition which was believed by Prout to constitute a distinct disease, and which he termed the "phosphatic diathesis." True phosphaturia can only be diagnosed after a quantitative analysis of the urine for phosphates by the uranium method (see URINE, EXAMINATION OF).

The clinical relations of an excessive discharge of phosphates are not yet clearly understood. In great activity of the brain, as when delirium is present, Dr. Bence Jones showed that phosphates were passed in excess. During later years Teissier of Lyons, and Dr. Ralfe, have observed an excessive phosphatic discharge in association with emaciation, thirst, polyuria and other symptoms of diabetes mellitus, and have termed the disease "phosphatic diabetes." With these exceptions, the clinical interest of the phosphates of the urine attaches entirely to their deposition in the urinary passages as a result of loss of acidity of the urine.

ROBERT MAGUIRE.

PHOSPHORUS, Poisoning by.—Phosphorus is met with either in the common yellow soluble form or in the allotropic form; of these the former only is poisonous, the latter being quite inert. Cases of phosphorus poisoning most commonly arise from children sucking the heads of lucifer matches or from the taking of "phosphorus paste" or "rat paste." The symptoms may appear in either an *acute* or *chronic* form; the subjects of the latter affection are usually workers in lucifer-match factories.

Symptoms.—**Acute Poisoning by**

Phosphorus.—The symptoms commence with the taste and smell of garlic. There is also intense pain in the mouth extending down to the stomach, with nausea and vomiting; the vomit may be blood-stained and luminous in the dark. Purging is also present. In severe cases delirium and fatal coma may come on in a few hours; otherwise, about the third day, jaundice and retention of urine, albuminuria, numbness and cramps in the limbs, fainting, somnolence, and convulsions become the most prominent symptoms. In cases less speedily fatal there may be subcutaneous, intestinal and other hæmorrhages, leading to the patient's death from exhaustion; recovery may, however, follow such symptoms. Acute yellow atrophy of the liver presents some features in common with phosphorus poisoning, but jaundice makes its appearance earlier in that disease, and nervous symptoms are present almost from the first. The speedy diminution of liver dulness would be a valuable sign of the disease as against poisoning. Acute yellow atrophy runs an even more rapid course than the poisoning, and is almost inevitably fatal.

Post-mortem Appearances.—The skin may be jaundiced, and, as well as the viscera, may show ecchymoses; the contents of the stomach and intestines smell of garlic, and may be luminous in the dark; the liver is enlarged, yellow, pale and mottled. Microscopically, the mucous membrane of the stomach is swollen, owing to the blocking of the tubular glands with degenerated and fatty epithelium, and the hepatic cells are found to have lost their outline and to be filled with oil globules. Fatty degeneration is present in the renal epithelium and throughout the muscular system generally.

Treatment.—Emetics should be given, and subsequently mucilaginous drinks; oil of turpentine (in 10-minim doses administered at short intervals) is the chemical antidote. The rest of the treatment would be symptomatic.

Chronic Poisoning by Phosphorus commences with pain in a tooth. After extraction of the painful tooth the wound in the gum does not heal; gradually the alveolus becomes exposed, the gums grow spongy, and the teeth fall out. The disease of the jaw progresses, and large pieces of bone are removed. The patient may then recover, or he sinks slowly from exhaustion consequent upon the long-continued drain upon his system. Now that

matches are made with allotropic phosphorus, cases of chronic poisoning by phosphorus are becoming very rare.

PHRENIC NERVE, PARALYSIS OF.—This is rarely due to disease or injury of the nerve trunk, but commonly to disease of the anterior grey matter of the spinal cord at the level of the third and fourth cervical nerves. It occurs in acute or chronic spinal myo-atrophy, and is not rare after diphtheria. Paralysis of the diaphragm has also been observed in lead palsy. In a few cases the loss of function has been attributed to rheumatic neuritis of the nerve trunk, and cases are recorded in which it was due to compression in the neck.

Symptoms.—The evidence of paralysis of the phrenic is inaction of the diaphragm. After experimental section of the phrenics, the two most constant phenomena observed are increased scope of the thoracic excursions and a distinct reversal of the abdominal movements in respiration. Clinically these symptoms are present in most cases, but in very varying degree. In ordinary quiet breathing they may be almost imperceptible, but become more clearly marked on the quickening of respiration which attends any exertion on the part of the patient. The extent and character of the abnormal movements also vary according as one or both nerves are paralysed.

In bilateral paralysis, such as is not rarely met with after diphtheria, there is nearly always excessive action of the lower ribs, and the abdominal movements are reversed, the wall receding instead of coming forward during inspiration and bulging out during expiration. The precise nature of the modifications of the normal movements will depend to some extent on the integrity or otherwise of the abdominal and intercostal muscles and on the degree of affection of the phrenics. When the paralysis is gradual in onset, the altered movements become established imperceptibly. But if, as has happened in the writer's experience, paralysis be suddenly developed, there is always more or less dyspnoea and lividity, of temporary duration. Accidents of this nature have probably sometimes been erroneously attributed to sudden heart failure. All spasmodic respiratory actions—sneezing, coughing—are performed with less energy. In post-diphtheritic cases the non-explosive character of the cough is very striking and constant. Paralysis of the diaphragm *per se* gives rise to but few symptoms,

but the supervention of bronchitis places the patient in a position of great danger.

Diagnosis.—This is not always easy. The symptoms should be looked for during quiet breathing, for in voluntary deep breathing the extra action takes place chiefly in the upper part of the chest. It must also be remembered that in women breathing is less diaphragmatic than in men, and in them also conscious attention to the act of breathing is apt to arrest the action of the diaphragm.

Further, immobility of the diaphragm may result from causes other than paralysis. Such are diaphragmatic pleurisy, injury, ruptured fibres, &c., and the diminished movements observed in cases of extreme emphysema of the lungs.

Then, again, in cases where the diaphragm is really paralysed there may be some doubt as to whether it moves or not. In patients with collapsed abdomen the expansion of the lower ribs is apt to lift forward the lax parietes so as to simulate a descent of the diaphragm. In other cases a sudden contraction (expiratory) of the abdominal muscles, more especially the recti, occurring almost before the end of inspiration, and tending to fill up the epigastrium, may be mistaken for a late inspiratory effort. In post-diphtheritic cases the lungs sometimes furnish confirmatory evidence. The writer has met with weak breathing and, more rarely, relative dulness, and moist râles at the bases, in several cases, and is inclined to attribute these physical signs to the presence of collapse and œdema of the pulmonary bases, occurring as a direct effect of the diaphragmatic paralysis on the lungs.

Prognosis.—This is favourable in the rare instances due to cold; rather less so in lead poisoning. It is unfavourable when the paralysis is part of a progressive spinal myo-atrophy. When due to acute cornual myelitis, it will depend on the evidence afforded by other symptoms of the extent of the damage to the region of the cord from which the nerves arise.

After diphtheria, the occurrence of diaphragmatic paralysis materially increases the gravity of the general prognosis. Out of fifteen cases in children under the writer's observation, only eight recovered. The gravity of the prognosis varies directly with the degree of paralysis, not only of the diaphragm but of the limbs and trunk, for in these cases the former is always part of a more general multiple paralysis.

If the view put forward above prove correct, the presence of signs of con-

solidation (collapse) at the bases, with evidence of oedema, will possess a grave significance not only as probably indicating a marked enfeeblement of the diaphragm, but also a condition of lung which must materially increase the work thrown on the right side of the heart, which in many instances is already showing signs of weakness. The development of broncho-pneumonia, with rise of temperature, is of the gravest import, and frequently ushers in a fatal result.

Treatment.—In all cases causal indications must be met. Counter-irritation over tender spots, if they exist, is called for in cases due to cold, while systematic faradization may be of value if the irritability of the nerve be not altogether lost. One rheophore should be applied in the neck just above the scaleni and the other over the diaphragm. A strong current is necessary.

In post-diphtheritic cases the treatment is largely that of the general disease, but, owing to the tendency towards recovery which characterizes this form of paralysis, no effort should be spared to help the patient to tide over the critical period. In the hope of being able to counteract to some extent the occurrence of pulmonary collapse and oedema, the writer has practised artificial respiration at regular intervals (three or four times a day) for ten or fifteen minutes at a time. This method of treatment has appeared to be decidedly beneficial in some cases, more particularly where the onset of the paralysis has been accompanied by distress of breathing and lividity. The results obtained, although far from uniformly satisfactory, have been sufficiently encouraging to warrant a more extended trial of this mode of treatment.

W. PASTEUR.

PHTHISIS.—A tubercular disease of the lungs, characterized by the occurrence of lesions, partly specific and in part inflammatory, which tend either to cascade and soften or to become fibrous.

This definition emphasizes the view, now held by most pathologists, that pulmonary phthisis is a single disease, and that it is invariably attended by the appearance in the lungs of the pathological product known as tubercle.

The conflicting views as to the nature of the tubercular process, the great variety in the lesions met with in the lungs, and the undoubted fact that in the production of many of them inflammation (though probably of a specific nature) plays an important part, have

been hitherto the chief obstacles to the general acceptance of the theory of the "unity of phthisis" and of its dependence upon a specific virus.

It is unnecessary to review at any length the various theories as to the nature of tubercle and its relation to phthisis which have at different times been more or less generally held.

Laennec believed that tubercle was a particular matter which was liable to be deposited in the lungs or elsewhere, either in the form of miliary nodules or as infiltrations of considerable portions of the lung (infiltrated tubercle). In either form the deposit was at the outset grey and transparent, but with a tendency to change into yellow or crude tubercle.

Buhl discovered that the pre-existence of a caseous focus was a frequent antecedent to the outbreak of tuberculosis—a fact which tended to confirm Laennec's view of the specific nature of the product.

Virchow subsequently urged that the process in phthisis is largely of an inflammatory nature, with a special tendency for the products of inflammation to undergo caseation, that the existence of caseous material is no proof of tuberculosis, and that the tubercle when present is, in many cases, grafted on to lesions which are of non-specific origin. Niemeyer's dictum, that "the greatest danger for the majority of consumptives is that they are apt to become tuberculous," is the terse expression of this view.

The researches of Villemin proved that tuberculosis could be produced by the introduction of caseous matter into a healthy animal; other observers, who have since admitted the error of their conclusions, maintained that they had disproved the specific nature of tubercle by producing acute tuberculosis by the inoculation of non-tuberculous material.

The doctrine of the unity of the disease and its dependence on a specific virus received important support from the publication by Koch in 1882 of his discovery of a bacillus in tubercular diseases of man and animals. This he had proved to possess pathogenic properties by the fact that, after repeated cultivations, acute tuberculosis was produced by the inoculation of healthy animals with the pure virus.

The numerous observations and experiments which have been made during the period which has since elapsed have, with few unimportant exceptions, tended to

confirm the truth of Koch's views, and at the present time the discovery of tubercle bacilli in the sputa of a patient suffering from some affection of the lungs is held to be conclusive evidence of the tubercular nature of the disease.

As yet no serious attempt has been made to prove that these organisms are constantly absent from the sputa of any considerable number of cases of phthisis, and it may be stated with confidence that the view of the essentially tubercular nature of the disease is now generally accepted.

The want of uniformity in the clinical features and morbid appearances of the disease is probably due to the varying degree of resisting power of the tissues of different individuals to the action of the virus, leading in the one case to death in the course of a few weeks or months, and in another allowing life to be prolonged for many years.

MODE OF ONSET.—This varies much in different cases. The following clinical types may be recognized:—

(1) *Insidious Onset.*—This is certainly the most common form in which the disease appears. The patient either is unable to fix definitely the time when his health became affected, or perhaps dates the attack from a cold of no unusual severity. There is a history of gradual failure of strength, with cough, some expectoration and emaciation. Sweating may have been present at night, and, on exertion, the breath is probably noticed to be short. Loss of appetite and dyspeptic troubles often form a prominent feature in the history of such a case. The patient is usually anæmic and emaciated. The tongue may be furred, with prominent red papillæ. If the temperature be taken in the afternoon or evening, it will probably be found to be from one to two degrees above the normal.

(2) *Bronchitic Onset.*—The cases presenting this mode of onset are scarcely less numerous than the last. There is usually a history of repeated attacks of bronchial catarrh or of acute bronchitis; cough may have been present in the winter for some years, and there may have been attacks of dyspnoea, with wheezing. Expectoration has possibly been profuse, and perhaps occasionally tinged with blood. The onset of the tubercular disease may be ill-defined or marked by emaciation, loss of strength, an alteration in the character of the cough, and often by the occurrence of night-sweats.

(3) *Pleuritic Onset.*—In these cases the appearance of the disease has been preceded by one or more attacks of acute basic pleurisy, either dry or with effusion; if the latter, the fluid may have been completely absorbed. In some cases there is a history of pleurisy, with effusion, affecting first one side of the chest and then the other, and in both complete absorption of the fluid may have taken place, the pleural surfaces probably becoming adherent.

The immediate onset of the pulmonary lesion is generally marked by cough, emaciation, pyrexia and night-sweats. In such cases, as in the types previously described, there is often a history of tubercular disease in the parents or in other members of the family.

(4) *Hæmoptoic Onset.*—In a certain proportion of cases of phthisis the health is apparently but little affected prior to the occurrence of an attack of hæmoptysis. This attack may be immediately followed by the ordinary symptoms and signs of phthisis, or, as not uncommonly happens, the attack is quickly recovered from, and, on examination of the chest shortly afterwards, few, if any, definite signs of disease may be detected. In such a case there may be a considerable interval before another attack of hæmorrhage occurs, but, after a time, the ordinary symptoms and signs of the disease appear. It is almost certain that in many cases of this kind there is an old tubercular lesion in the lung, and that the attack of hæmoptysis apparently marking the onset of pulmonary tuberculosis has really been preceded by symptoms and signs which have escaped either notice or memory. Such cases are not uncommon in men beyond middle age in whose family there is no history of tubercular disease.

(5) *Acute or Pneumonic Onset.*—This is probably the rarest mode of onset of the disease. Two forms may be recognized.

(a) *The Lobar Pneumonic Type*, in which the attack somewhat simulates one of acute lobar pneumonia of the apex, being marked by rigors, high temperature, quickened pulse and respiration, and expectoration, which may be more than simply "rusty," slight hæmoptysis being sometimes present. The case is very likely to be regarded as one of ordinary croupous pneumonia, until the unusual degree of emaciation or the absence of a crisis suggests an examination of the sputa, when the discovery of tubercle bacilli shows its real nature.

(b) *The Broncho-pneumonic Type.*—This is the most serious and rapidly fatal

form of phthisis, and has been termed "galloping consumption" and "florid phthisis." The lesions are not localized to the apex or a single lobe, but spread rapidly through both lungs; caseation quickly follows consolidation, and is in its turn soon succeeded by softening. The patient is usually of a markedly "tubercular type," the face is flushed, the eyes are bright, there is high fever, with rapid emaciation and severe cough, hectic sweatings, and purulent or blood-stained sputa.

(6) *Acute Miliary Tuberculosis*.—It is usual to describe this form of pulmonary tuberculosis as a separate disease, and doubtless its widely different clinical and pathological characteristics to some extent warrant the distinction, but according to the view above stated both are manifestations of the tubercular process, and the fact only serves to illustrate how various may be the appearances assumed by tubercular lesions of the lungs, and also how widely different may be the symptoms which accompany the condition. It is not suggested that a case of acute miliary tuberculosis of the lungs should be described as one of phthisis, but there is a possibility that when the view of the essentially tubercular nature of that disease is completely accepted the term pulmonary tuberculosis may displace phthisis in its nomenclature (see TUBERCULOSIS, ACUTE MILIARY).

It is important also to recognize that one of the greatest dangers to which phthisical subjects are liable, and one of the modes in which the disease often proves fatal, is an outbreak of acute tuberculosis, in which miliary granulations are rapidly formed throughout portions of the lungs hitherto free from infiltration.

On the other hand, it is to be remembered that in a certain proportion of cases of acute miliary tuberculosis the lungs are not the primary source of the general infection.

SYMPTOMS.—In the account of the various modes of onset of the disease, incidental reference has been made to the symptoms; these will now be described in detail.

Cough is perhaps the most prominent, and is certainly the symptom which most attracts the patient's attention. It is usually present in the earliest stage of the disease, and is rarely absent for any lengthened period throughout its course. At first "hacking," it becomes in the advanced stages loud and hollow; it is especially common on lying down at

night and on rising in the morning, when, if severe, it may cause retching or vomiting, and leave the patient much exhausted. It is often especially troublesome after taking food or after exertion.

Expectoration.—This in the early stages is frothy and viscid, small in quantity, and may occasionally be blood-streaked. When softening is in progress, it is profuse, purulent and "nummulated;" the latter appearance is, however, not characteristic of excavation, as it may be observed in the sputa of chronic bronchitis. The methods of examining the sputa for bacilli and elastic tissue are fully described in the article on EXPECTORATION (q.v.).

Fever.—The course of the temperature in phthisis is subject to much variation. It is generally considerably raised during those periods of the disease when active changes are in progress in the lungs, but cases are recorded in which, although extensive lesions occurred, the temperature did not rise above 99° F. The rise, as a rule, begins in the early part of the afternoon and attains its maximum between 8 and 10 P.M., the temperature then falls, so that during the after-part of the night and in the early morning it may be sub-normal. When softening and cavity formation are in active progress, the temperature often assumes a hectic type, rising to 103° or 104° F. in the evening, and falling to the normal, or below that point, during the night.

It is noteworthy that the pyrexia of phthisis is not generally accompanied, as in other diseases, by thirst, loss of appetite and other evidence of constitutional disturbance, so that patients not uncommonly continue at their work although in a state of high fever. When pyrexia gives place to a normal temperature at all periods, a favourable change has almost certainly occurred at the site of disease in the lung. The significance of the rise of temperature, which often occurs after an attack of hæmoptysis, is discussed in the article on that subject (q.v.).

Emaciation is one of the most prominent symptoms of the disease, and its degree is usually a trustworthy indication of the severity of the case. In such as present the "acute" or "pneumonic" mode of onset, the loss of weight is often extremely rapid.

Hæmoptysis.—As the subject is fully treated in the article under this heading (q.v.) but little need be added here. The idea that phthisis may originate from an attack of hæmoptysis (phthisis

ab hæmoptoe) is no longer entertained; that the hæmoptysis is the consequence, and not the cause, of the pulmonary changes is now made evident by the fact that, in cases of so-called primary hæmoptysis, an examination of the blood ejected may demonstrate the presence of tubercle bacilli, sometimes in considerable numbers. It is, however, true that in many cases, after a profuse hæmorrhage, there are no distinct signs discoverable on examination of the chest; but, unfortunately, it is not generally recognized that the "absence of physical signs" and the "absence of disease" are not one and the same thing. The presence, in the great majority of cases of profuse hæmoptysis, of an aneurysm of some branch of the pulmonary artery is insisted on in the article to which reference has already been made.

Dyspnœa.—Although the patients generally admit to some shortness of breath on exertion, there is rarely any obvious dyspnœa until the lungs have become extensively involved in the disease. The anæmia which is almost invariably present reduces the requirements of the system, and so enables the diminished pulmonary area to supply the blood with sufficient oxygen.

Pain is often present even in the early stages; it is generally referred to the pectoral regions, and may be associated with tenderness. It is probably due to the condition of the underlying pleura, where possibly adhesions may be either forming or present, or it may be evidence that intra-pulmonary changes are approaching the surface.

Night-sweating is often present from the onset of the disease, and constitutes one of its most distressing symptoms; if the patient fall asleep during the day, sweating may also occur. The perspiration is at times so profuse as to necessitate a change of linen more than once during the night. Patients usually complain of feeling much exhausted after the sweating.

Pulse.—There is, as a rule, some increase in the pulse rate, associated with a low state of the arterial tension.

Digestive Disorders are of frequent occurrence, loss of appetite, especially for fatty food, nausea and vomiting being amongst the most common symptoms. Vomiting is occasionally present in the early stages; later, it often follows the violent attack of coughing which so many patients experience in the early morning.

Diarrhœa is usually a phenomenon of the advanced stages of the disease, and

is then, as a rule, due to the presence of tubercular ulceration of the bowel combined with catarrh of the mucous membrane of intervening areas. Albuminoid disease is another not infrequent cause of diarrhœa.

THE SO-CALLED STAGES OF PHTHISIS.

—It has been customary to describe three stages of the disease—the first, or stage of consolidation; the second, of softening; and the third, or cavity stage. These stages mark the advance of a pathological process, but have no relation whatever to the disease as a whole, or any clinical value as guides to prognosis, a patient with a well-marked cavity being often in a far more satisfactory condition than one in whom the disease has not advanced beyond the stage of consolidation. It is also in great part owing to the general use of these terms that the tendency of tubercle to undergo fibrous transformation has received comparatively little attention.

PHYSICAL SIGNS.—It is convenient to describe the physical signs of the disease as they are elicited in the course of the examination of the chest.

Inspection.—Although it is true that phthisis may affect persons of any physiognomy and any build, most writers agree in regarding two types of chest as specially liable to be attacked—the one, a long narrow chest with wide intercostal spaces, a small antero-posterior diameter and projecting scapulæ; the other, a broader chest, which is very flat in front, the sternum sometimes being actually curved backwards instead of forwards.

The chief points to which attention should be directed on inspection are the supra- and infra-clavicular regions, where signs of flattening may be observed. The movement of the point of the shoulder should be watched during inspiration for any slight differences in the degree of expansion of the upper part of the chest. A considerable defect of the whole of one side is readily observed when the chest is viewed from the front, the patient being seated in a good light, but slight changes are more obvious when the observer stands behind the patient and looks over his shoulders.

Palpation.—When the hands are placed upon the chest defective expansion at one apex often becomes more evident than it was on inspection. Changes in the vocal fremitus are of great importance in determining the presence of early disease of the upper lobes. The reader is referred to the article FREMITUS for a full account of their significance. It

may, however, be stated here that when in consequence of the retraction of a cavity at one apex the overlying pleura has undergone considerable thickening the vocal fremitus may (as is usually the case with thickened pleura) be less distinctly conducted there than beneath the other clavicle.

Percussion.—In the early stages a slight difference in the percussion note may sometimes be elicited on tapping the clavicles, when elsewhere the difference is unappreciable. It may also be found that the resonance does not extend so high above the clavicle on one side as on the other, and, again, a slight difference on the two sides may be noted when the breath is held after a deep inspiration, owing to less air entering the affected lung. Firm percussion in the supra-spinous fossæ will often elicit a dull note when the evidence obtained from the front of the chest is doubtful. The note may also obtain a slightly tympanitic quality, and at a later stage varying degrees of dulness up to wooden percussion note may be elicited. When a large cavity is present at the apex, a cracked-pot sound (*bruit de pôt fêlé*) may be present (*see PERCUSSION*).

Auscultation.—The earliest sign in cases with insidious onset is usually weak inspiration with prolongation of the expiratory sound. The inspiratory sound at a later period becomes harsh, and is often "wavy." At a still later period it is bronchial in quality. In cases of the "pneumonic" type there may be well-marked tubular breathing below the clavicle and in the supra-spinous fossa, but the tubular (whiffing bronchial) quality of breath sound is not commonly present in phthisis unless some area of lung be completely consolidated as the result of an accompanying pneumonia.

When a cavity has formed, the signs of that condition will be observed beneath the clavicle or in the supra-spinous fossa (*see AUSCULTATION*).

It is important to note that the breathing over the unaffected apex is usually exaggerated (harsh), with a prolonged expiratory sound, a compensatory change; and that, when one apex is certainly diseased, the absence of this change at the other may be an indication of early disease there also.

The only adventitious sounds in the early stage of a case with insidious onset are, as a rule, a few fine crackling râles on inspiration or after cough. At a later period, when softening is in progress, moist crackling râles and clicking sounds

appear, and are replaced by gurgling râles when a cavity has formed, if it contain secretion.

In a case of the pneumonic type, tubular breathing and crepitation may be present over a considerable area.

It not infrequently happens that the physical signs are more marked in the supra-spinous fossa than above or beneath the clavicle, probably owing to the fact that the lesion is often situated nearest to the posterior surface of the lung (*see PHTHISIS, LOCALIZATION OF LESIONS*).

The changes in the vocal resonance are fully described in the article on *AUSCULTATION OF THE VOICE (q.v.)*.

DIAGNOSIS.—The diagnosis of phthisis has become a much simpler matter since the discovery of the bacillus tuberculosis. In all cases in which there are definite physical signs of disease of the lungs it is now customary to examine the sputa; if bacilli be present, the case is regarded as one of pulmonary tuberculosis, whilst their absence after repeated examination tells very strongly indeed against such a diagnosis. In cases with a pneumonic onset it may be necessary to wait until the period at which a crisis should occur is past before pronouncing an opinion.

In cases of anæmia, in which the presence of phthisis is often suspected, the discovery of the various hæmic murmurs is generally sufficient to exclude the presence of phthisis, as the two conditions are rarely, if ever, associated. A caution must, however, be given against mistaking the sound which can nearly always be produced by the pressure of the stethoscope on the jugular vein for the true *bruit de diable*, with which a thrill is nearly always associated. The stethoscope should be placed upon the sternal end of the clavicle where it cannot compress the vein. It is also important not to mistake the false murmur in the second left interspace, which is so commonly present with disease of the left upper lobe, for a pulmonary hæmic murmur (*see AUSCULTATION OF THE HEART*, p. 78, section 4). The occurrence of slightly blood-stained expectoration in the early morning often leads to a suspicion of phthisis, but in such cases the blood generally comes from the gums, and disease of the lungs is rarely present.

Emphysema may mask the presence of a tubercular lesion; hence it is always desirable to examine the sputa in cases of emphysema and bronchitis occurring in spare individuals.

COURSE; DURATION; PROGNOSIS.—Whilst the discovery of lesions indi-

cating arrest of pulmonary tuberculosis is one of the most common occurrences of the post-mortem room, the complete arrest of cases of phthisis clinically recognized is unfortunately an event much less frequently met with. It may occur during the stage of consolidation, a caseous mass remaining, which shrivels and becomes encapsuled, the surrounding lung becoming emphysematous, or after a cavity has formed. In the latter case the cavity contracts, and the overlying pleural surfaces are separated, the intervening space being filled by the effusion of fluid from the vessels of the neighbouring adhesions; this fluid subsequently assumes a gelatinous consistence, and afterwards undergoes changes ending in fibrillation, the resulting tissue being in time of almost cartilaginous density.

As already stated, the most rapidly fatal cases of phthisis are marked by an acute onset of the "broncho-pneumonic type," death may occur in such cases in a few weeks or months, but, as a rule, no matter how acute the symptoms at the onset, some amelioration in the patient's condition takes place after a time. In the cases of the lobar pneumonic type, a tendency to arrest is often noted after the expulsion of the softened caseous material and the formation of a cavity. The cases with an insidious onset are generally slowly progressive, with occasional periods of quiescence. The average duration of such cases has been variously given as two years and a half (Pollock) to eight years or more (Williams), but such statements are really of but little value, owing to the great variety of circumstances which have to be taken into consideration in forming an estimate as to the probable course and duration of any given case. The greatest dangers which beset the subject of chronic phthisis are the formation and rupture of a pulmonary aneurysm, and the occurrence of acute pulmonary tuberculosis from the sudden infection of the blood or lymph vessels with the virus of the disease. A caseous nodule may remain quiescent and encapsuled in the apex of a lung for many years, giving, perhaps, little or no sign of its presence, when from some cause its capsule gives way, a communication with a bronchus or vessel is established, and acute tuberculosis is set up.

The duration of cases of the hæmorrhagic type is often prolonged, and in those characterized by the bronchitic mode of onset the course is generally

chronic. The prognosis in cases of the pleuritic type is, as a rule, unfavourable, there being a distinct liability to the occurrence of acute tuberculosis.

It may be stated, in conclusion, that complete arrest of the disease is occasionally observed under the most unfavourable circumstances, such cases falsifying every rule of prognosis.

Complications.—The complications of phthisis are for the most part the effects of the transference of the specific virus from the lungs and its arrest in other parts of the body, the result being the formation of tubercles, which generally either undergo softening or set up inflammation; on the other hand the tubercle bacillus may have been present in the body before it attacked the lungs. As the greater number of such affections are described under their appropriate headings the mere enumeration of them will be here sufficient.

The complications connected with the serous membranes are described in the articles on PERITONITIS, TUBERCULAR; PLEURISY, TUBERCULAR; PNEUMOTHORAX, and MENINGITIS, TUBERCULAR.

Those of the mucous membranes in the articles on INTESTINES, TUBERCULAR DISEASES OF; LARYNX, TUBERCULOSIS OF; PHARYNX and TONGUE, TUBERCULAR ULCERATION OF.

Those of the lymphatic glands in the articles on LYMPHATIC GLANDS, DISEASES OF, and TUBERCULOSIS (including Scrofula).

The tubercular affections of the large viscera, all of which may occur as complications of pulmonary tuberculosis, are treated of in the articles on ADDISON'S DISEASE (tubercular disease of the suprarenal capsules); BRAIN, TUMOURS OF (tubercular); KIDNEY, TUBERCLE OF; LIVER, CIRRHOSIS OF (tubercular).

Albuminoid disease is a frequent complication of chronic phthisis, it will be found described under its appropriate heading.

The affections of bone and joints are mentioned in the article on TUBERCULOSIS.

Disease of the middle ear occasionally occurs as a complication of phthisis.

Enlargement of the male breasts has been noted as a comparatively rare event in the course of the disease.

Fistula in Ano.—This affection is probably not quite so common amongst phthisical patients as used to be thought. It has been observed in about 2 per cent. of the in-patient cases at the Brompton

Hospital. It is believed to be due to the occurrence of a tubercular ulcer of the bowel, which perforates the wall of the intestine and subsequently forms an external opening by the side of the anus, but the invariable existence of the ulcer has not been clearly demonstrated.

Treatment.—The condition rarely gives rise to any very troublesome symptoms and may safely be left alone, the old idea, and one that is still entertained by many writers, being that it is dangerous to resort to operative measures in such cases as the existence of the discharge has a beneficial effect upon the lung. Whether this be so or no it is difficult to say, but it is certain that the presence of another morbid process in the body has a distinct influence upon the tubercular process, witness the extreme frequency with which evidence of arrested tubercular disease is found in the bodies of those dying from cancer.

If an operation be performed the diseased tissues must be completely removed.

PATHOLOGY.—According to the view here adopted, phthisis is a local tuberculosis of the lungs accompanied by inflammatory changes, the resulting morbid products tending either to caseation and softening or to fibrosis.

Initial Lesion.—The first effect of the presence of the bacillus in the air passages is to set up changes in the finer bronchi, which extend either into the alveoli or into the surrounding connective tissue; in the one case the initial lesion is intra-alveolar, in the other inter-alveolar.

Tubercles are continuously formed throughout the progress of the disease, and according as the alveoli or connective tissues are affected, rather tend to undergo, on the one hand caseation and softening, on the other fibrosis; softening, however, may occur in either extra or intra-alveolar lesions.

In the *Caseous Form of the Initial Lesion* it appears to the naked eye as a small rounded nodule of consolidation, having a somewhat lobular appearance. In the centre the colour is either whitish or yellow, and opaque; towards the periphery it is of a greyish tint. A large area of consolidation is formed by the coalescence of a number of such small nodules.

The initial lesion in the intra-alveolar form is seen microscopically to centre around a minute bronchus, which is plugged with an inflammatory exudation composed of round cells and desquamated epithelium; the neighbouring alveoli are also stuffed with large catar-

hal cells, derived from the alveolar epithelium; the epithelial cells are often enlarged, and may be desquamating. The wall of the bronchiole is generally considerably infiltrated with round cells.

These constitute the appearances in that part of the lungs where the process has most recently commenced. Where it has been in operation for some time, large caseous areas may be found; in parts where the process is of still older date, cavities of various size and irregular shape and outline will have formed. The larger cavities, like the large areas of consolidation, are formed by the coalescence of smaller ones (*see VOMICA*). Caseation often begins within the bronchus and extends to the alveolus; softening commences in the central parts of the caseous masses, often in the neighbourhood of a bronchiole.

The process of caseation consists essentially in the death of the cell elements, followed by their fatty degeneration. The evidence of the specific nature of the changes here described is furnished by the discovery of the bacillus chiefly within and around the giant cells of the tubercles.

In the *Fibroid Form of the Initial Lesion* hard pigmented tubercles of varying size are found, with well-defined outline, presenting the typical appearances of the miliary tubercle. The microscopical appearances differ, in that the changes are chiefly inter-alveolar, being mainly in the wall of the bronchiole and in the surrounding connective tissue; the intra-alveolar changes are much less marked, and the evidence of inflammation there is but slight.

In this form there is far less tendency to caseation and softening than in the other; if cavities form they tend to contract, and progress is slow, the general course of the disease being chronic. Pleural thickening may be extreme.

These cases constitute one of the forms of so-called *Fibroid Phthisis*, which, as the late Dr. Moxon said, is only "phthisis of which the history has been forgotten," owing to its very chronic course. In such cases the upper lobe of the lung often presents the most typical picture of "fibroid" phthisis, whilst in the lower lobe the changes characteristic of ordinary chronic phthisis are seen in progress.

In some cases large areas are found infiltrated with tubercle of a dense fibroid consistence, often forming deeply pigmented, rounded masses having a racemose arrangement. These are seen to be

spreading slowly at their margins, and undergoing fibrous changes in the central portion, but they show but little tendency to break down.

ÆTIOLOGY.—The condition of the lungs which affords a favourable soil for the multiplication of the bacillus tuberculosis may be either inherited or acquired. There is apparently a deficient resisting power in the tissues of the subjects of inherited phthisis, so that they are unable to resist the attack of the bacillus. In them the onset of the disease usually occurs at an earlier period of life than in those who have no such family history. Dr. Reginald Thompson, comparing 2000 cases of phthisis with an hereditary history with an equal number in which the disease was acquired, shows that the liability for the disease to manifest itself before the age of twenty-five is much greater in the former case (1131 to 871). When there is a history of phthisis in both parents, the disease is likely to appear at a still earlier age.

It may be stated generally that everything which tends to lower the state of the bodily health also tends to favour the development of phthisis; and, conversely, that everything which increases the resisting power of the body to disease diminishes the tendency to pulmonary tuberculosis.

The question of diathesis is a very difficult one. All those who have seen a very large number of cases of phthisis have probably formed some mental picture of the type of individual whom they consider specially liable to the disease, but in the opinion of some authorities such types are merely examples of individuals who are lacking in robustness and vigour, or are ill-grown or badly developed. The tendency at the present time is to regard what used to be called *scrofula* as the manifestation of a tendency to tuberculosis, if such a condition exist; *scrofulous* and *tuberculous* lesions being practically identical, and alike due to the action of the specific bacillus.

The breathing of impure air, the want of good and sufficient food, excess in alcohol, and residence on a damp clay soil are all important factors in lowering the resisting power of the individual to the specific virus of the disease.

Frequent pregnancies and prolonged lactation are also potent in producing the tendency, although whilst the mother is carrying the child the tuberculous process generally undergoes temporary arrest or amelioration. The rapid extension of the disease which often occurs

after delivery has been attributed to the wide inhalation of the specific virus during the deep inspirations which accompany parturition.

The subjects of diabetes are specially likely to develop consumption, and syphilis is also a factor in the ætiology of the disease. Workers in various trades in which dust is given off from the materials employed are frequently the subjects of the disease; such are particularly coal-miners, iron-workers, stone-masons, knife and fork grinders, needle-makers and potters. Exposure to cold and wet, by lowering the general health, and locally by diminishing the resisting power of the pulmonary tissues, predisposes to the disease. The entrance of a foreign body into the lung may be the starting-point of disease which terminates with pulmonary tuberculosis.

Phthisis may occur at any period of life; it is generally believed to attack young adults (aged from twenty to twenty-five years) in greatest numbers, but this is denied by some authorities.

Treatment.—As the children of phthisical parents are certainly more prone than others to acquire the disease, prophylaxis is naturally of very great importance. Every care should be taken to maintain the general health and nutrition of the child. This is to be effected by careful attention to diet, clothing and place of residence, a dry and bracing air being preferable. Special attention should be paid to all the ailments of childhood, and especially to those, such as measles and whooping-cough, which tend to be complicated by catarrh of the pulmonary mucous membrane. Cod-liver oil and syrup of the iodide or phosphate of iron are of especial value at this period. It is undesirable that a phthisical mother should suckle her own child.

The occurrence of glandular enlargements in the children of phthisical parents should be considered a serious indication of the presence of the inherited tendency.

In youth and early manhood precautions are still more necessary, and at that period removal from this country to New Zealand or Australia, coupled with the adoption of a healthy out-of-doors life may prevent the appearance of the disease.

If the onset be of the acute or pneumonic type, rest in bed is essential during the continuance of the pyrexia. Antipyrin, antifebrin or hydrobromate of quinine may be given with a view of lowering the temperature, but they have no specific effect upon the course of the

disease. An effervescing mixture with aconite is sometimes useful, and at a later period, when the most acute symptoms have passed off, small doses of iodide of potassium in a bitter infusion are of use. When there is a distinct remission of the acute symptoms, a mixture of hypophosphite of lime gr. v, syrup of the phosphate of iron and glycerin āā ʒj, in an ounce of water may be given two or three times daily.

The treatment of hæmorrhage from the lung is fully discussed in the article on HÆMOPTYSIS (*q.v.*). Cough is an important symptom, and the patient is always urgent for its relief. If sedatives be given it should only be to check an ineffective cough or one which prevents the patient from obtaining rest; such a linctus as the following—Liq. morphinæ acetatis ℥viij, sp. chloroformi ℥iiij, succi limonis ℥xv, mucilaginem acaciæ ad ʒj—is often efficacious under such circumstances. Or a linctus containing honey (℥xxv) and dilute sulphuric acid (℥v) ad ʒj may be tried. Lozenges, such as the tr. morph. et ipecac. of the British Pharmacopœia, or a lozenge containing liquorice, are often of service. An inhalation of oil of pepperment (℥xv) on the sponge of a perforated zinc inhaler is very efficacious in checking cough. Menthol may also be used for the same purpose. If the digestive powers be impaired, and there be loss of appetite and a furred tongue, an alkali with hydrocyanic acid and compound infusion of gentian is preferable. Counter-irritants, such as a blister the size of half a crown or equal parts of the tincture and liniment of iodine, applied to the affected apex are also of use. The iodine should always be applied in the morning, as, owing to the irritation produced being sometimes in excess of that desired, it is liable to keep the patient awake if applied at bedtime.

Cod-liver oil is generally best taken either after meals or at bedtime; at first one or two teaspoonfuls may be given twice daily, the quantity being gradually increased; if it cannot be borne, maltine or cream may be substituted.

Night-sweating is best treated by regular bedtime doses of sulphate of atropine, from $\frac{1}{16}$ to $\frac{1}{8}$ grain, in the form of pill. The majority of cases obtain relief by this means, but in some the atropia has no effect whatever, while in others it produces the dry throat and dilated pupil to such an extent as to prevent its regular use. Oxide of zinc, in 5-grain pills, should then be tried, or, failing

success by them, picrotoxin, in doses of $\frac{1}{16}$ grain. A trial may be given to strychnine if these fail. Sponging the chest with toilet vinegar at bedtime is often of service in checking the sweating. The exhausting effect of continual sweating is very great.

In ordinary cases the first attack subsides under this form of treatment, and the patient is left with a slight cough and more or less mental and bodily depression. Advantage must be taken of this pause in the progress of the disease to restore and build up the strength by nourishing food and tonic treatment on the one hand, and by guarding against exposure to risks of fresh cold, on the other. It must always be remembered that the disease shows a marked tendency to extend at irregular periods, and with each of these attacks a similar line of treatment requires to be followed out to that suggested for the initial stages. It must, however, be frequently modified according to the progress which the disease has made. Each successive attack will leave behind it some trace in the shape of a further area of lung tissue rendered unfit for service. In the more advanced stages and when the periods of febrile disturbance are longer, and the patient has become inured to them, it is less necessary to confine him to the house, but in cases whilst there is a definite tendency to recurrent attacks of bronchial catarrh, the best results are obtained when the patient is kept in a warm and equable temperature, and not allowed to expose himself to the frequent changes of temperature which are inseparable from an outdoor existence in England in the winter.

The treatment of cases during the periods of comparative quiescence of the disease must of necessity vary with the patient's social position. If he be independent of the necessity for work he should at once be placed in the best climatic surroundings suitable to his particular case (*vide infra, Climatic Treatment*). Warm and transpirable clothing to the limbs as well as to the trunk is essential for all patients, whether they be at home or abroad.

For those less fortunately situated, who must perforce remain at their own homes, close supervision is necessary to guard against the risks of catching cold. The prevention of draughts of cold air within the patient's own house is often a most important factor in the prophylactic treatment. Avoidance of chill and strict rules as to the changing of damp

wearing apparel, are of the utmost importance, and it is equally essential to insist upon the patient's remaining within doors after dusk. As regard remaining in the open air, it may be said that the longer the patient can remain out of doors the better, always provided that the temperature be above 55° F. and that he be not exposed to winds, damp air or actual wet. Quiet corners can often be arranged even in the smallest town gardens in which a phthisical patient can spend the greater part of the day, during the summer months, in fresh air, without risk of such exposure. He should endeavour to sit as much as possible in the sun. Nourishing food is an essential, but care is required in regulating the diet for individual cases, as there is very frequently a tendency to dyspepsia, even when the lung symptoms have become quiescent. Milk is the most important article of diet, and the richer and more creamy it is the better it suits the phthisical habit, provided that it can be borne at all, for, like cod-liver oil, it is sometimes repugnant to the stomach. Although it is always an advantage to maintain a large proportion of fatty matter in the diet, it is not advisable to give large quantities of milk or cream in association with cod-liver oil. Maltine after meals, or light bitter ale with the chief meat meal, will generally be of service, but moderation is necessary in the use of alcoholic liquors generally. Hot milk, with a little rum in it, is a favourite prescription for the early morning hunger which so commonly follows the attack of coughing with which the patient may wake. Strychnine, phosphoric acid and the hypophosphites of lime and soda are largely used in this stage, but not with uniform success.

The diarrhoea which sometimes complicates the later stages of tubercular phthisis, if it be due to ulceration, is best treated by a pill of sulphate of copper (gr. $\frac{1}{4}$) powdered opium (gr. $\frac{1}{2}$) ext. gent. (gr. ij) of which one or two may be given for a dose, or by frequent doses of aromatic sulphuric acid and tincture of opium, or opium enemata, with occasional saline purges given in the early morning. A close watch must be kept over the diet, which must be plain and non-stimulating. Diarrhoea, the result of amyloid degeneration of the intestinal wall, is most intractable and can rarely be checked altogether. Strong astringents are, on the whole, the most successful. Complete rest directly after taking food, and support to the abdomen by

means of a broad flannel binder, should be insisted upon.

Since the demonstration of the presence of the bacillus in tubercular tissues, a variety of efforts have been made to discover some method whereby the active vitality of the micro-organism may be checked and its reproduction prevented, after it has established itself within the pulmonary tissues. The inhalation of antiseptic vapours, the subcutaneous or intra-pulmonary injection of antiseptic fluids, and the injection of large volumes of sulphuretted hydrogen or carbonic oxide gas into the rectum, in the hope of the rapid absorption through the portal system and conveyance hence to the lungs, have each in turn been suggested and tried by competent observers. The results, however, are not such as to warrant the adoption of any one of them as regular modes of treatment. By thus deluging the whole body with the antiseptic fluids or gases some effect has undoubtedly been produced in the lowering of the body temperature for the time, and in some instances, an improvement of the general condition with respect to appetite and gain of weight has ensued, but on the other hand it has not been shown that any marked diminution in the number or reproductive activity of the bacilli has been effected, nor have the good results been maintained for long after the discontinuance of the treatment, whilst the treatment itself is in each case either unpleasant, painful or positively nauseating and repugnant, and hence by no means popular with patients. This line of treatment has been most successful in the later stages when cavities have formed, and when active suppuration is in progress, and the patient is suffering from the effects of septicæmia.

Attempts have often been made to check septic influence in the lungs by keeping the patient for many hours in a room in which the atmosphere is continually charged with antiseptic vapour. Favourable cases have been recorded, but against these must be set a long array of patients in whom headache, nausea, and complete loss of appetite have been the only results achieved.

Inhalation of air medicated with creosote, pinol, iodoform, eucalyptol or other antiseptic and sedative substances is at times comforting to individual patients, and may have a marked effect in allaying cough. The simple

oro-nasal inhaler is sufficient for this purpose. Where there is much laryngeal irritation, the steam draught inhaler medicated with carbolic acid or tincture of benzoin may be employed (*see* INHALATION). Spray inhalations are useless in the treatment of phthisis.

The all-important object being to maintain general nutrition, it is obvious that no line of treatment of phthisis which may be liable to interfere with appetite or digestion should be attempted, even though it may promise relief to some particular symptom; caution should therefore be exercised in prescribing for phthisical persons to put the requisite drugs into a palatable form. Phthisical patients as a rule suffer from the consumption of too much physic, as the hopefulness which is characteristic in some types of the disease leads the sufferers to try every new nostrum that may be offered to them by the professional remedy-mongers. It is never advisable to prescribe physic to a phthisical patient as a mere *placebo*; the temporary good that may be obtained by the faith that the physic may inspire is not commensurate with the disadvantages in the way of disturbed digestion or appetite that are at all times liable to be induced from very slight causes.

Climatic Treatment.—The climate of the British Isles during the cold months of the year is, with a few local exceptions, unsuitable to phthisical persons. During the summer months, on the other hand, the climate is, as a rule, to be preferred to that of any foreign health resort. In selecting a residence for phthisical patients during the winter season, one or two cardinal points require to be considered both by patient and physician.

First, it must be clearly understood that a partial climatic treatment is not worth attempting. Patients seeking to benefit by it must follow it out to its conclusion, and be content to forego all thoughts of business matters, and to give themselves up entirely to the mode of life prescribed for them. Secondly, hopes should not be held out that one or more winter's residence abroad will cure the disease. Climatic treatment is only curative in so far as it guards against recurrence of inflammatory attacks affecting the air passages, and enables the patient to live a healthy out-of-door life without fear of exposure to risks of "catching fresh cold." The natural tendency of the diseased tissues to return to a state of health is then allowed free play, and nature alone can complete the cure.

Thirdly, the patient's own habits and surroundings must be carefully taken into consideration. To some persons a sea life is intolerable, others are unable to speak foreign languages and have an aversion to foreign customs; some are only happy in a whirl of gaiety, others derive the most enjoyment from solitary life in the mountains, &c. Such considerations as these are of real importance in selecting a climate or health resort for each variety of temperament.

The most favourable climate for the arrest of phthisical inflammation is one which shall be free from all impurities, organic or inorganic; of high temperature, subject to regular variation in the evening and not liable to sudden changes; abundant in sunshine and free from cold winds. The relative moisture or dryness of the air cannot be so positively defined for all cases, as some require a more humid atmosphere than others.

Added to these, it is necessary that the hygienic conditions of the locality should be satisfactory, and the accommodation and the food supply sufficient. All these advantages can hardly be found combined in any one locality, but the greater number of them may be met with in many of the southern health resorts, and on long sea voyages. The treatment of phthisis by residence at high altitudes, requires separate consideration.

At the Swiss and American altitudes, besides the advantages of purity, equability and stillness of the climate, the rarefaction of the air places the respiratory organs under new and unaccustomed conditions. The muscular movements of respiration are increased and the chemical interchange of gases goes on more freely. The common result of this extra activity thrown upon the lung is the production of more or less emphysema, which is often most marked about the diseased area and may, by masking the abnormal physical signs, lead to the erroneous idea that local disease has disappeared. No cases of well-marked laryngeal tuberculosis should be sent to high altitudes, or such as are in a febrile state, nor should any be allowed to go who do not possess a sufficient area of healthy lung to enable them to breathe without discomfort in the rarefied atmosphere. Cases of dilated or enfeebled heart are specially unsuitable for mountain residence. With these provisos the following list will indicate approximately the appropriate climatic treatment for various stages of phthisis.

Patients with a family predisposition

and any threatening of actual phthisis should not spend the cold months in England if they are in a position to avoid it. A slow sea voyage in a sailing ship to Tasmania or Queensland, starting in October, a journey to the Cape and a few months' residence in the neighbourhood of Cape Town (not in Cape Town itself), with a visit to Madeira and the Canary Islands *en route*, should be advised. The journey to India, going out in October and returning in April, with a short stay in Egypt on the way home, can also be safely undertaken, but at other times of the year the transitions from heat to cold are too great. For those obliged to remain in England, the East coast watering-places of Scotland and England should be selected during August and September, but with the onset of cold weather and damp winds, the sheltered places on the south and west coasts should be sought. Hastings, Ventnor, Bournemouth, Sidmouth, Torquay and Tenby are all preferable to the northerly and easterly towns and counties.

In cases where disease, whether inherited or not, has definitely declared itself, and has begun with hæmorrhage, the patient should, if possible, be removed from the English climate as soon as the first part of the autumn is over, but not until the constitutional disturbance brought about by the hæmorrhage has quieted down. The selection of a suitable climate must depend upon the temperament of the individual. Excitable persons who are liable to febrile disturbances do best at sea, provided that they can afford all the luxuries obtainable on board ship, and that they are able to withstand the first effects of seasickness; for them the Australian voyage round the Cape should be chosen. The phlegmatic temperament on the other hand, is more likely to benefit by a residence at one of the Swiss health resorts at a high altitude. It is only permissible to send a patient for the first time to the altitudes, before the onset of winter, and if time allows, it is better that pauses should be made at a lower level station before finally settling down for the winter at the highest level. In the same way, the return in the late spring should be made gradually, and no patient should return to England before the third week in May. Of the high level health resorts, Davos Platz, St. Moritz, the Maloja, and Wiesen are all provided with every luxury that can be reasonably desired, and they are all approachable

by easy stages where halts can be made, both going and returning. Patients should be guided as to their mode of life at the altitudes, by local medical advice.

It has been claimed for the mountain health resorts, that the purity of their atmosphere has an antiseptic effect, but this idea is disproved by the well-ascertained fact that the number of bacilli in the sputa does not decrease in proportion to the improvement in the general health.

Cases which begin insidiously with catarrh, wasting and anæmia, and varying degrees of fever, are as a rule most benefited by the Mediterranean coast climate. The French or Italian Riviera presents a variety of climates suitable to various phases of this condition, but local advice should be sought before a definite selection is made. For the febrile cases, Hyères is especially adapted; and, for the more anæmic and feeble, either Cannes or San Remo may be chosen. A slow ascent to the altitudes may sometimes be advisable when all fever has subsided, but caution is required. Of the English coast resorts, Ventnor and the upper levels of Torquay are the best.

For the class of cases in which the disease has already produced well-marked structural changes in the lungs and in which there is a tendency to pneumonic consolidation, or where bronchitis is apt to occur with some rise of temperature, there are few climates better than those of Madeira and the Canary Islands. Such cases, however, do very well at Hyères, and, if there be not much fever, at most of the sheltered places on the Riviera, and at Algiers. For chronic cases with limited phthisical lesions, but a good deal of chronic bronchial irritation and dilated tubes, coupled with emphysema or much expectoration, a residence in Egypt and especially in Upper Egypt, is to be commended. The coast of California and the districts around Santa Barbara and Los Angeles are also suitable to these cases, provided that a good part of the time be spent on the higher grounds.

Cases of advanced chronic disease, where the respiratory surface has been much reduced, must never be sent to elevated health resorts, but will be most benefited by equable warm and fairly moist climates. Madeira and Algiers may therefore be selected provided that local advice be taken as to the choice of position for residence in either place. The results of climatic treatment may be roughly summed up thus:—That the

early cases if they be not attended with much pyrexia, do best at the altitudes; that cases of an excitable and irritable kind are more fitted either for sea voyages or for the warm and moist climates; that established disease is best treated by residence in equable climates where prolonged periods of sunshine can be enjoyed and where as few irritating elements as possible are present, such as dust, insects or cold winds (*vide CLIMATE*).

E. CLIFFORD BEALE.

J. K. FOWLER.

PHTHISIS, LOCALIZATION OF LESIONS OF.—An examination of the literature of pulmonary phthisis will show how little attention has been paid by most writers to the exact site of the lesions in the lungs and their relation to the chest-wall. Whilst almost every one has his own explanation to offer for the apex-site of the primary lesion, and all recognize that in the early stages of phthisis the base is but rarely affected, scarcely any mention is made of the mode in which the disease progresses between these two points, or of the order in which the various parts of each lobe are affected.

The only reference to this part of the subject which is to be found in the writings of Laennec* is as follows:

"Tubercles are almost always developed primarily in the summits of the superior lobes, and especially in that of the right; and it is for this reason that, in these points, and particularly in the latter, vast tuberculous excavations are frequently met with. It is not very rare to find similar ones on the summit of one lung, the rest of these organs being quite healthy and presenting no tubercle; but in these cases, also, the patient has often betrayed no sign of pulmonary phthisis, or has displayed none but such as were very equivocal, and has died of another disease. It is more common to find an excavation, and some crude tubercles already far advanced in the summit of the lungs, and the rest of these organs which are still crepitant and healthy in other respects, infarcted with a countless number of very small semi-transparent miliary tubercles, of which scarcely any yet present the central yellow point.

"It is evident that these miliary tubercles are the product of a secondary crop, and one much more recent than that which had given rise to the excavations.

The results of dissection, compared with those drawn from observations on the living subject, have convinced me that these secondary crops take place at the period when the first-formed tubercles begin to soften.

"We frequently find within the same lung evident proofs of two or three successive secondary eruptions, and we may then almost always observe that the primary eruption occupying the summit of the lung has already reached the stage of excavation; that the second, situated around the first, and rather lower down, is formed by tubercles now yellow, at least for the most part, but as yet smaller in size; that the third, formed of crude miliary tubercles, with some yellow points in the centre, occupies a still lower zone; and finally, that the base of the lung, and its inferior border, present a last eruption of entirely transparent miliary tubercles, some of which are likewise found in the intervals left here and there by the preceding eruptions. . . .

"Exceptions to this order of development are uncommon. Primary excavations are very rarely met with in the centre or at the base of the lung: it is less frequent for the left lung to be more affected than the right."

Louis* on the same subject writes as follows:

"Tubercles were almost always more numerous, larger, and more advanced in development at the apex than at the base of the lungs; among the cases analyzed in this work—one hundred and twenty-three in number—two only furnish exceptions to this rule."

The statements in the writings of Bayle, Andral, Portal, and others do not vary materially from the foregoing, and add nothing to our knowledge of the exact site of the lesions.

Walshe,† in describing the anatomical characters of phthisis states:

"Yellow tubercle, whether preceded or not by the semi-transparent grey granulation, and whether accumulated in isolated or grouped masses, or infiltrating the pulmonary stroma, affects a special preference for the apex and upper lobe—either spreading thence downwards uniformly, or leaving islets of parenchyma of various sizes unoccupied in its transit towards the base. Exceptions to

* "Researches on Phthisis," trans. by Walshe, Syd. Soc., 1844, p. 2.

† "Diseases of the Lungs," fourth ed., p. 415, par. 1228.

* "Traité de l'Auscultation Médiate," trans. Ed. Th. Herbert, 1846, p. 265.

this topographical mode of progress (on which the diagnosis of the disease so often turns) are infinitely rare in chronic tubercularization, the base of the lung proving the primary seat of the process, not oftener, it has been calculated, than once in sixty or eighty instances.

"The softening process, like that of original deposition, commences at the apex of the lung and spreads downwards."

To Dr. William Ewart* belongs the credit of having been the first to draw attention to the "remarkable proneness to disease" of the dorso-axillary region, and of its "greater proneness to excavation." In an examination of 304 lungs he found cavities in this area in 227 cases. He states:—"I doubt whether clinical observations have hitherto led to so high an estimate of the frequency of this lesion. A knowledge of this pathological fact cannot fail to stimulate a more searching clinical exploration of a region so liable to disease, and to strengthen the conclusions which our diagnosis may derive from physical methods of examination."

Dr. Ewart adopts the areas of the chest-wall as the basis for his classification of cavities according to their situation; in this article the lesions are described as they affect the different lobes of the lungs.

The following extract is from the work of a writer of a still more recent date, the late Dr. Hilton Fagge:†

"... I must insist on a point which has long been known both to physicians and pathologists, namely, that the upper parts of the lungs are almost invariably affected with phthisis, in whatever form, before the lower parts; and that in all but the most exceptional instances the disease spreads downwards from the apex to base often with almost perfect regularity.

"I must not omit to add that the rate of the proclivity of the apex is liable to some other exceptions. In certain cases the tubercles appear a little lower down, leaving one or two cubic inches at the extreme summit of the upper lobe free from them. But sometimes the middle of the organ is first affected, or even the lower lobe, the upper angle of which is indeed very often the seat of a vomica, in ordinary instances of phthisis.

"But I believe it never happens that the tubercular process spreads upward from the base of a lung into and through the upper lobe. And it is certain that what has sometimes been called 'basal phthisis' is a distinct affection, which has been described above under the name of chronic pneumonia."

It may fairly be said that, until quite recent times, our knowledge of the progress of pulmonary phthisis has been limited to the fact that "the softening process, like that of original deposition, commences at the apex and spreads downwards."*

The writer has not anywhere met with the statement that *the disease, in its onward progress through the lungs, in the majority of cases, follows a distinct route, from which it is only turned aside by the introduction of some disturbing element.* Now, this fact, if fact it be, is of great importance in that it tends to give increased definiteness and certainty to information which we may gain from an examination of the chest. If we are prepared to find lesions anywhere and (the apex excepted) attach no particular importance to their being situated in one place rather than another, our knowledge of the conditions present and our ability to forecast the future progress of the case may be very different from what it would have been had we begun the examination with a clear idea, not only that the disease as a rule followed a definite line of march, but also of the actual route likely to be taken. We should then first have searched the apex in various sites of election of primary lesions; finding evidence of disease there, we should have followed it along its usual course in the upper lobe and have estimated its extent by noting its furthest limits. Then, turning to the lower lobe, with a knowledge of the point most likely to be first attacked and of the lines along which the disease progresses in that part of the lung, we should have determined the presence and amount of infiltration; and our examination completed, the mental picture of the extent of lung involved might have been almost as clear as though the organs had been exposed to our view.

On the other hand, we might discover that the disease had not followed its ordinary course, and that, whilst the total area of lung involved was still very small, a part usually affected at a late period only, already showed signs of

* Gulstonian Lectures, 1882, on "Pulmonary Cavities: their Origin, Growth, and Repair."

† "Principles and Practice of Medicine," 1st ed. vol. i. p. 647.

* Walshe, *op. cit.*, p. 415.

infiltration. This would start us on a search for some disturbing factor, such as a previous attack of pleurisy, which, by diminishing the resisting power of a portion of the lung, had allowed such an inversion of the natural sequence of events to take place; or, more important still, it might inform us that the disease was not of that subacute or chronic type in which the progressive development of lesions about to be described is usually found. Or again, it might be a question whether or no the disease was of a tuberculous nature; now the probability of such being the case is much increased if the lesions are found in situations most affected by tubercle.

This is no fanciful statement of the exact knowledge to be obtained from physical examination of the chest in phthisis, if the assertion of the existence of a definite "line of march" of the disease should prove correct. Extensive lesions may of course be present of which there may be no evidence; but that fact tells for nothing, as we are only concerned with cases in which physical signs are to be found.

These conclusions are based on considerable experience in the post-mortem room; but, as the particular distribution of lesions here described is likely to be overlooked unless sought for in a certain way, it is necessary to describe first the mode of examining the lungs adopted. Following the recommendations of Virchow,* the sections should always be in the same lines, the first exposing the largest possible surface, and all others in the same lobe parallel with it; the organ after the examination presenting an appearance similar to the leaves of a book. The left lung is placed on the table with the root downwards and the *base* towards the examiner. If there be no interlobar adhesions, or only such as can be easily broken down, holding the blade parallel with the table, make a section through the upper lobe at the level of half the depth of the interlobar sulcus, commencing just below the apex and extending thence along the posterior border and the sulcus. The section must stop before the part is entirely severed. This "leaf" should then be turned over, and the whole of the upper lobe will be displayed.

The first section through the lower lobe is made along the prominence of the posterior border, through the base, and

then towards the sulcus again, stopping before the part is completely separated.

If the interlobar adhesions cannot be separated without injury to the lung, a single long section should be made from apex to base along the posterior border, and carried through the lung toward its anterior margin.

The right lung is placed on the table with the root downwards and the *apex* towards the examiner.

Any easily separable interlobar adhesions having been dealt with as already directed, the point of the blade is inserted at the lower and anterior extremity of the upper lobe, and an incision is made at the level previously mentioned, upwards and outwards towards its apex and anterior margin. The middle lobe is separately incised from below upwards. The incision in the lower lobe, starting from the anterior margin of the base, is continued through this part and along the prominent posterior border, stopping short of the sulcus, so that the section may not be complete.

If the interlobar adhesions cannot be easily broken down, a single section is made as in the left lung, but from base to apex instead of *vice versa*.

If it be made a rule to examine the lungs after this method, there is no difficulty in appreciating the arrangement of lesions about to be described; if, however, a number of irregular incisions be made, and no definite plan adopted in the examination of each lobe separately, all traces of the progressive march of the disease may easily be lost.

As it is rare to find any one who, without having had reason to study the subject specially, is acquainted with the exact relations of the different lobes of the lungs to the chest-wall, and as such knowledge is obviously necessary in order to follow the spread of the lesions from one point to another, it is necessary to introduce here a few brief anatomical details.

The apex of each lung rises about one inch and a half above the clavicle. On the left side almost the whole of the front of the chest is occupied by the upper lobe, only the anterior extremity of the lower lobe being visible. On the right side the front of the chest above the fourth interspace is occupied by the upper lobe, below that by the middle lobe, only the point of the lower lobe coming in, as on the opposite side. Behind, the fact which is chiefly to be noted is that the lower lobes reach as high as the third dorsal spine, and the

* "Handbook of Post-mortem Examinations."

right, being, however, usually rather lower than the left, thus occupy almost the whole of the posterior surface of the chest, except that part which roughly corresponds to the supra-spinous fossæ. The septum between the left upper and lower lobes, starting from the third dorsal spine posteriorly, extends obliquely downwards and forwards, crossing the fourth and fifth interspaces, passing behind the scapula and sixth rib in the axilla to the upper border of that rib in the mammary line.

On the right side the line of the septum terminates at the eighth rib just outside the nipple line; a second septum, starting behind the scapula, just external to the posterior fold of the axilla, runs transversely forwards along the fourth interspace to the middle line, thus forming the middle lobe. The above statements are approximately true in the majority of cases, but the exact relations of the various lobes and septa vary somewhat in different subjects. The limits of the bases of the lungs are not now of importance.

The erroneous views most commonly held with regard to the relation of the lobes to the chest-wall are, first, that a considerable portion of the front of the chest is in relation with the lower lobes; secondly, that the right middle lobe is situated much further back than is actually the case; and, thirdly, that the lower lobes occupy far less of the posterior surface than they really do.

In the diagrams, for the sake of greater clearness, the outlines of the lobes are completed, and in Fig. 1 the upper lobes are separated more widely beneath the sternum than is actually the case.

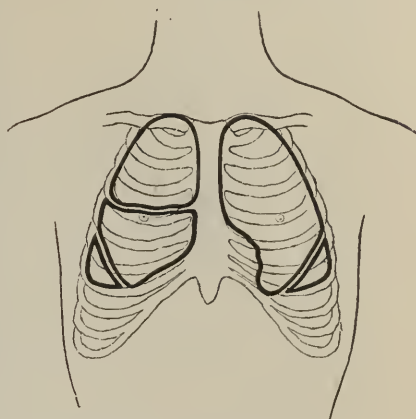
The exact situations occupied by the primary and secondary lesions in the different lobes of the lungs will now be described in detail.

Sites of Lesions in the Upper Lobes.—

The extreme apex of the lung is not often, in the experience of the writer, the site of the primary lesion; this usually occupies one of the two situations marked on the accompanying diagrams (Figs. 3 and 4). Of the two the former is by far the more common; it is situated from an inch to an inch and a half below the summit of the lung, and rather nearer to the posterior and external borders. Lesions in this situation tend to spread in the first instance backwards, possibly from inhalation of the virus whilst the patient is lying down. This line of extension explains the fact that an exam-

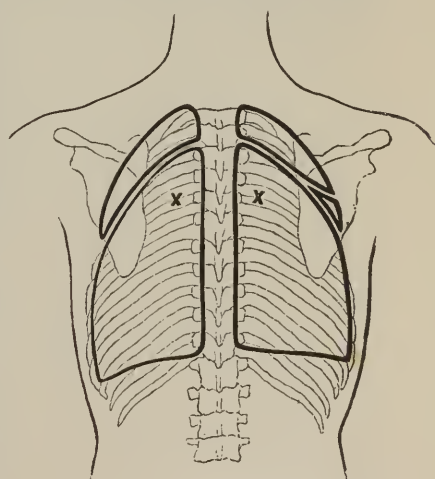
ination of the supra-spinous fossa will often give certain evidence of the presence of disease when the physical signs in front of the chest have left us in

FIG. 1.



Showing the relation of the lobes of the lungs to the front wall of the chest.

FIG. 2.



Showing the relations of the lobes to the wall of the chest posteriorly. The X marks the usual site of early infiltration of the lower lobes.

N.B.—The apex of the right lower lobe should have been slightly lower than the left.

doubt, proving that the changes, as is generally the case, are more advanced there than towards the front of the

chest. *The investigation, therefore, of this part of the lung is so important that it should never be omitted.*

From this primary focus, which in front corresponds either to the supra-

FIG. 3.



Diagram of a vertical median section of the lung, from back to front, showing one of the sites of the primary infiltration in phthisis; also the site of early infiltration of the lower lobe.

FIG. 4.



Diagram of the left lung, viewed from its outer border, showing a less usual site of primary disease of the apex.

clavicular fossa or to a spot immediately below the centre of the clavicle, the lesions often first spread downwards along the anterior aspect of the upper lobe, about three-fourths of an inch

within its margin, frequently occurring in scattered nodules, separated perhaps by an inch or more of healthy tissue. If, therefore, the disease appear to be limited to the upper lobe, a careful examination should be made along a line running about an inch and a half from the inner ends of the first, second, and third interspaces. It is not unusual to find in these scattered nodules the only evidence of disease on the anterior aspect of the lung, when, posteriorly, excavation has advanced to such a degree that little more than the two layers of the pleura, united by adhesions, remain. This is an additional reason for making a careful examination of the supra-spinous fossa.

The second and less usual site of the primary affection of the apex is seen in Fig. 4. This corresponds on the chest-wall with the first and second interspaces below the outer third of the clavicle. The lines of extension are usually downwards, so that after a time an oval area of lung is involved, occupying the outer part of the upper lobe in the situations just mentioned. It has seemed to the writer that the spread of the disease is more rapid when the primary lesion occupies this site. The lesions in the advanced stages—cavities—are of course formed by the coalescence and extension of these primary foci. The scattered nodules of consolidation on the anterior surface of the lung often unite and break down, forming a long sinuous cavity, which may extend almost to the lower anterior margin of the upper lobe; posteriorly, where, as already stated, the signs of excavation are usually most distinct, the further progress of the disease is generally arrested at the pleural reflexion in the interlobar septum. This was found by Dr. Ewart to be destroyed, and the cavities in the upper and lower lobes united, in only five out of 152 consecutive cases of phthisis examined post mortem.

In rare cases the whole of a lung may undergo destruction, a large sac, bounded by the pleura, being formed.

Site of Lesions of the Middle Lobe.—The middle lobe of the right lung, which is believed by Aebv, from the arrangement of the bronchi, to be the analogue of the upper lobe of the left, is rarely the site of a primary tuberculous lesion. It is, almost invariably, affected after the upper lobe of the same side and usually at a rather late period of the disease,

whilst not uncommonly it escapes altogether. The lesion most commonly found there is a coarsely granular tuberculo-pneumonic nodule, often of large size, in process of caseation at its margin, with an area of softening in the centre.

Extension of the Lower Lobe.—The lower lobe of the lung primarily diseased is usually affected at a very early period of the disease, often long before any extensive infiltration or destruction of the upper lobe has taken place, and as a rule before the apex of the opposite lung.

The site of the secondary infiltration of the lower lobe is indicated in Figs. 2 and 3. It is situated about an inch to an inch and a half below the upper and posterior extremity of the apex of the lower lobe, and about the same distance from its posterior border, although in some cases it may be found nearer to and even at the apex of this lobe. This situation nearly corresponds on the chest-wall to a spot opposite the fifth dorsal spine (*vide* Fig. 2), midway between the border of the scapula and the spinous processes.

The infiltration of the lower lobe at this site in the early stage of phthisis is one of the most constant features in the pathological anatomy of the disease, and its recognition is a point of the greatest clinical importance, as the existence of a lesion in the lower lobe at this spot coincident with physical signs at the apex, even though the latter be in themselves of doubtful import, is strongly suggestive of the presence of pulmonary tuberculosis.

At what an early period this infiltration of the lower lobe takes place may be gathered from the fact that from a careful observation extending over several years, it may be stated that in the great majority of cases, when the physical signs of disease at the apex are sufficiently definite to allow of the diagnosis of phthisis being made, the lower lobe is already affected.

It would therefore appear that the upper and posterior part of the lower lobe is a spot in the lungs only second in point of vulnerability to the apex itself. The writer cannot confirm the statement of Fagge, already quoted, that "sometimes the middle of the organ, or even the lower lobe" (not at any rate this part of it) "is first affected," as he has never yet met with a case, either during life or on the post-mortem table, in which this area was affected whilst the apex on the same side was

free from disease (but *vide infra* as to "crossed lesions").

The absence of any sign of infiltration there is not, however, proof of the non-tuberculous nature of an apex lesion, as it is quite possible in some cases, from the physical signs alone, to arrive at a diagnosis of phthisis before the lower lobe is affected. The importance of the examination of the sputa has been already referred to.

On one point it is possible to speak positively, viz., that no report of the condition of the lungs in a case of apical disease is complete without a distinct statement as to the condition of the "posterior apex" (for so, for brevity's sake, it may be called) of the lower lobe. If careful attention be given to this point less will be heard of cases of "catarrh of the apex," which are often assumed to have been non-tubercular from the subsequent disappearance of the physical signs; such cases must often be examples of arrest of the disease in the first stage and help to explain the very frequent discovery of that condition post-mortem.

In the description of the result of climatic or medicinal treatment in the early stage of phthisis it is commonly stated that the disease was limited to the apex of one or both lungs. In a recent account of the climatic treatment of twenty cases of phthisis, in thirteen of these the disease is said to have been limited to one apex, whilst in four both apices were affected, and in no case is there any mention of the condition of the lower lobes except when the whole of a lung is stated to have been affected.

Cases in which the lesions are confined to both apices, no other portion of either lung being affected, are not common. In a case recently observed in which death occurred from tubercular meningitis, with recent pulmonary tuberculosis, the apices of both lungs were the seat of old disease, whilst the lower lobes had at that time entirely escaped infiltration. There were signs of arrest of the disease at each apex, showing clearly that in both lungs the process had been stayed before the lower lobe on either side had become affected. In the left lung the changes were of much older date than in the right, and the patient had clearly been the subject of two separate attacks of tuberculosis.* It is common enough

* In a very similar case in which death occurred from acute pulmonary tuberculosis,

to find arrest of pulmonary tuberculosis when one apex and its corresponding lower lobe have been affected, but it rarely happens that arrest occurs at both apices without infiltration of either lower lobe. The early stage of the disease at which the lower lobe is implicated is well illustrated in lungs presenting apex lesions which have undergone arrest. The area of disease may not be larger than a cherry or an olive, but if the process was tuberculosis a nodule will almost invariably be found in the lower lobe. This arrangement of lesions thus becomes an important rough post-mortem test of the presence of tubercle, and is strong evidence in favour of the existence of a "line of march" of the disease.

In a few of the cases observed, post-mortem lesions not presenting a trace

FIG. 5.



Showing the line of extension of a lesion of the lower lobe along the interlobar septum.

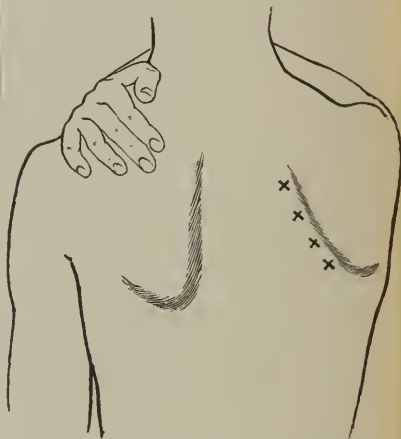
of tubercle were present at the apex—*e.g.*, collapse followed by bronchiectasis, or changes resulting from old pleurisy the lower lobes were quite free from disease.

This lesion once established tends to spread backward towards the posterior border of the lung, and at the same time laterally along the line of the interlobar septum (Fig. 5), forming a doubly

an old caseous lesion the size of an olive was present in each apex; one was completely encapsuled, the other had recently broken down and had been in part discharged through a bronchus, the walls of which were ulcerated; death occurred from acute pulmonary tuberculosis.

wedge-shaped area of infiltration gradually narrowing as it extends outwards. It follows from this that even in the early stages of the disease, in order to ascertain the extent of lung affected, we must examine the lower lobe, not only opposite the fifth dorsal spine, but also along the line of the interlobar septum. This line is roughly marked by the vertebral border of the scapula, when with the hand upon the spine of the opposite scapula the elbow is raised above the level of the shoulder (Fig. 6).

FIG. 6.



Showing the position of the arm when the vertebral border of the scapula indicates (roughly) the usual line of extension of lesions along the interlobar septum.

The mode of extension towards the base of the lung is not usually by an advancing line of consolidation but by scattered nodules of infiltration often arranged in a racemose manner (Fig. 7). Even at the termination of a chronic case some healthy, or at least uninfected, tissue will generally be found at the base, even of the lung primarily affected. This freedom of the bases from phthisical lesions is another very marked feature in the pathological anatomy of the disease. In estimating the probability of any basic lesion being tuberculous in origin, it is important to observe whether the physical signs of disease in the lower lobe are continuous from its apex posteriorly, downwards to its base; if so the lesion is probably tuberculous. If the base be affected, but the apex of the lower lobe be free from disease (*vide* Fig. 8), the basic

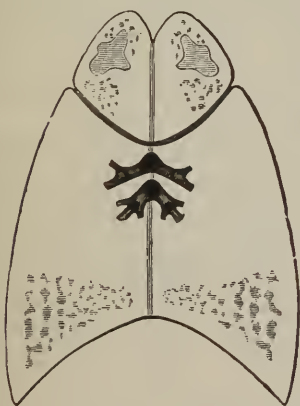
lesion is either non-tuberculous—*e.g.*, due to œdema and collapse, followed by bronchiectasis, catarrhal pneumonia, or

FIG. 7.



Showing the usual mode of extension of the disease towards the base of the lung.

FIG. 8.



Typical arrangement of lesions in a case of apical phthisis with non-tuberculous disease of the lower lobe.

pleurisy, &c.; or if tuberculous, the resisting power of the base has been diminished by some previous affection—for example, an attack of pleurisy followed by partial collapse; but the presumption is strongly in favour of a non-tuberculous lesion.

In enumerating the exceptions to the usual arrangement of the lesions, the varieties of chronic disease which may be

met with at the bases of the lungs have been tabulated.

Mode of Extension to the Opposite Upper Lobe.—Tuberculous infiltration in the upper lobe of the lung not primarily affected often occurs at an early period, but not usually until after the disease has attacked the lower lobe of the lung first affected.

The lesions may be found in either of the common situations indicated in Figs. 3 and 4, and are therefore symmetrical in site, but in different stages on the two sides.

There is, however, a third site for the secondary infection of the opposite upper lobe, which is figured in the accompanying diagram (Fig. 9). It is situated close to the interlobar septum, about midway

FIG. 9.



Showing an occasional site of lesion in the lung not primarily affected.

between its upper and lower extremities, and corresponds on the chest-wall to the upper part of the axilla. Small areas of consolidation form here and coalesce, but rarely break down into a cavity of any considerable size. Once established, this lesion tends to spread laterally, inwards and upwards, and is often found to occupy a considerable area of the lung when the apex is quite free from disease.

Infiltration of this area, when present, generally follows that of the lower lobe of the lung first affected.

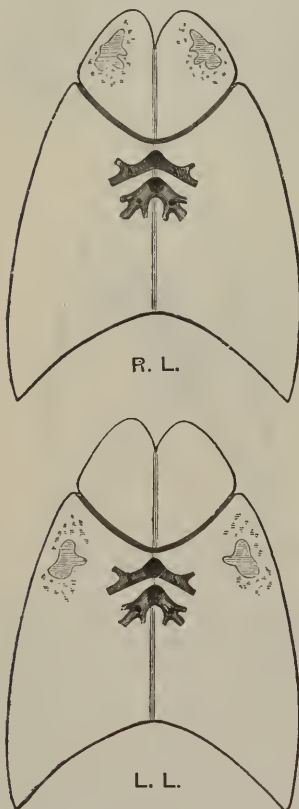
It follows from this fact that, in addition to the apex, the upper part of the axilla must be carefully examined before the other lung can be pronounced to be free from disease in a case of phthisis apparently limited to one apex.

Extension to the Lower Lobe.—The dis-

tribution of the lesions in the lower lobe of the lung secondarily diseased is usually similar to its fellow on the opposite side and presents no peculiarities. The first infiltration is situated below the posterior apex, and this extends along the interlobar septum and ultimately downwards towards the base, but it is rare for the lower margin to be reached before death takes place.

Crossed Lesion of the Lower Lobe.—The writer has met with a considerable number

FIGS. 10 AND 11.



Illustrating a "crossed lesion," i.e., from right apex to left lower lobe.

of examples post-mortem, and has been able to recognize a few clinically of what may be termed a crossed lesion of the lower lobe (Figs. 10 and 11). The usual mode of extension to the lower lobe is, as just stated, from (say) the left apex to

the left lower tube, but occasionally the lower lobe of the lung primarily affected escapes infiltration, and the disease crosses over to the right lower lobe. In such a case, the site of secondary infiltration is the usual one near the posterior apex. In all cases, therefore, of apex disease it is necessary to examine both lower lobes before deciding that the disease is limited to that spot.

Exceptional Arrangement of Lesions.—As already stated, the line of march here laid down, although covering the great majority of cases, is subject to certain exceptions. Speaking generally, this arrangement of lesions is seen in its most typical form when the progress of the disease is slow, and is less distinctive of cases marked by acute symptoms and rapid extension from lobe to lobe and from one lung to another. Time is necessary for the temporary localization of the disease which such a mode of progress as is here described requires, but there is rarely any inversion of the natural order. The disease spreads in each lobe from above downwards, hardly ever from below upwards, but in the lower lobe the onward march may be so rapid that one does not find that limitation of the affection for a time to the posterior apex and extension along the interlobar septum which are such marked features in the pathological anatomy of cases which run a subacute or chronic course.

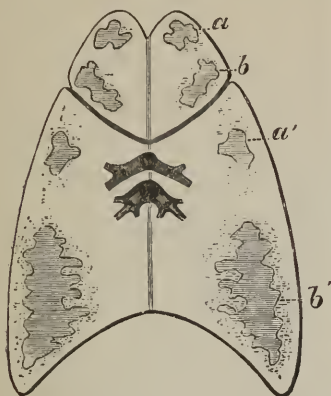
Upper Lobe.—In an example lately observed a lesion which had gone on to the stage of cavity appeared to be placed almost midway between the two sites of primary lesions indicated in Figs. 3 and 4. In this case the posterior part of the upper lobe and the apex of the lower lobe were apparently not affected, as there was a complete absence of physical signs in the supra-spinous fossa and also opposite the fifth dorsal spine. It is possible that further observations may show that the disease tends to run a different course when the primary lesion occupies this site.

When the usual sites of infiltration in the upper and lower lobes are already occupied by arrested lesions, and a second tubercular infection of the lung occurs at some later and perhaps distant date, the more recent lesion in the upper lobe usually occupies a position close to the interlobar septum, whilst that in the lower tube is situated along the posterior border, and extends almost to the base (Fig. 12).

This observation is of importance in so far as it helps to explain the occur-

rence in some cases of basic disease, and will be referred to again in the descrip-

FIG. 12.

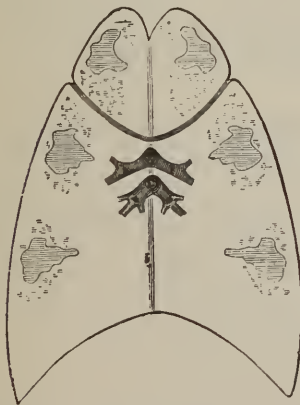


Illustrating the situation of lesions in secondary infection of a lung the seat of arrested phthisis; *a, a'*, arrested lesions; *b, b'*, recent lesions.

tion of lesions of the lower lobes occupying exceptional situations.

Lower Lobe.—The accompanying diagram (Fig. 13) illustrates an unusual

FIG. 13.



Illustrating an unusual arrangement of lesions in the lower lobe.

lesion, of which the writer has met with several examples.

A second cavity, almost equal in size to that at the posterior apex, is seen in the lower lobe about midway between that spot and the base, and close to the posterior border, the intervening area

being almost free from disease and the base quite unaffected. In no case observed has this cavity been present whilst the usual area of disease in the lower lobe remained uninfiltated.

Basic Lesions.—Reference has already been made to the comparative freedom of the bases of the lungs from tuberculous disease; whenever, therefore, a lesion is found in this situation a most careful survey should be made, both of the history of the case and of the physical signs present, before coming to the conclusion that the basic disease is tuberculous.

The most common varieties of chronic disease affecting the basis of the lungs may be classified thus:

(a) *Non-Tuberculous Basic Disease.*

1. Collapse of the lower lobe caused by pleural effusion; followed by absorption of the fluid and falling in of the lower part of the chest on the affected side.
2. Collapse from the same cause, followed by cirrhosis of the lung and bronchiectasis.
3. Empyema opening into the lung.
4. Hepatic abscess, or hydatid cyst of the liver, communicating with the lung.
5. Collapse of the lower lobe from pressure on the main bronchus by a growth or enlarged and infiltrated mediastinal glands, followed by bronchiectasis.
6. Diffuse gangrene of the lower lobe resulting from a communication between the bronchi and the œsophagus, either directly or through the medium of a softened bronchial gland.
7. Chronic pneumonia and bronchiectasis following on the impaction of a foreign body in one of the bronchi of the lower lobe.
8. Unresolved and chronic pneumonia of the lower lobe.
9. Bronchiectasis secondary to catarrhal pneumonia and collapse. This lesion is rarely found except in children.

(b) *Non-Tuberculous Basic Disease complicated by subsequent Tuberculosis.*

Cases presenting basic lesions are occasionally met with in which the disease, originally non-tubercular, has had the tuberculous process engrafted on to it at some later period; the lower lobe being infected, either directly or, which is perhaps more common, subsequently

to the apex of the same lung. This complication is very likely to occur where bronchiectasis forms a part of the original lesion, but may also be found in cases of chronic pneumonia and in other forms of non-tuberculous basic disease enumerated above.

(c) *Basic Phthisis.*

1. Phthisis with physical signs most marked at the base, but the oldest lesions at the apex.
2. Phthisis with arrested lesions at the apex and at the posterior apex of the lower lobe, more recent lesions in the upper lobe and also at the base (*vide* Fig. 12).
3. Primary basic phthisis.

Cases illustrating several of the conditions here tabulated are described by Dr. Percy Kidd, in a paper on Basic Tuberculosis Phthisis,* from which some of the headings here used have been taken.

The mere enumeration of the many varieties of disease affecting the bases of the lungs is sufficient to show what caution is necessary before arriving at a diagnosis of primary basic tuberculosis.

Dr. Kidd narrates two such cases, being the only instances met with in 412 consecutive cases of phthisis examined post mortem; he is of opinion that a larger number of examinations would probably reduce the proportion of basic to apical phthisis to 1 in 500. During a post-mortem experience of six years not a single such case has been observed by the writer, and, as Dr. Kidd very rightly insists, none but pathological evidence can be accepted on this point, for it is only by a prolonged experience in the making of autopsies that one can become adequately impressed with the fallacies attendant upon physical diagnosis.

When the lower lobe is shown on post-mortem examination to have been the site of primary tubercular infection it will usually be found that its resisting power and functional activity have been diminished by previous disease either of the lung or pleura. In both of Dr. Kidd's cases, already referred to, firm pleuritic adhesions were found at the base.

In nearly all cases presenting lesions in unusual situations, it is possible by careful inquiry and examination to determine the cause of the departure from the normal course.

In such cases as show the arrangement here described most typically, it is pro-

bable that the disease spreads chiefly by inhalation of the virus from one point to another through the medium of the bronchi. Where, however, the blood or lymph vessels form the chief channels of dissemination, as for example in acute pulmonary tuberculosis, and probably also in the more acute forms of phthisis, it is difficult to recognize, either during life or on the post-mortem table, that the lines of extension of the disease are such as are here indicated. This does not, however, diminish the value of these observations, provided they are sound, for *the mere fact that no definite line of march can be made out is often in itself of the greatest importance in the prognosis of the case*, as it may indicate that the disease will run a rapid course. One of the chief dangers which beset the subject of chronic or arrested phthisis is the liability at any time to an outbreak of acute pulmonary tuberculosis. In such a case it is constantly seen, post mortem, that whilst the older lesions have followed the course here described, the remaining and previously healthy portions of the lungs have been rapidly infiltrated with miliary granulations arranged in no definite order. That in the interpretation of physical signs their exact site is a matter of importance has always been held with respect to lesions at the apices; this doctrine may be extended to all signs of disease, no matter in what part of the lungs they may be found.

J. K. FOWLER.

PHYSICAL EXAMINATION.—

In accordance with the plan adopted throughout this work such terms as are in common use and likely to be sought for independently (PALPATION, PERCUSSION, AUSCULTATION, MENSURATION) have been described under their proper headings. It is therefore only necessary here to indicate the order and method in which a physical examination should be conducted, and to describe the appearances observed on INSPECTION.

The presence of any given disease is determined by the existence of *signs*, which are either obvious to, or discoverable by, the observer, and of *symptoms*, which are subjective sensations appreciable by the patient alone. The word *sign* is generally qualified by the adjective *physical*, and the present tendency is to limit that term to such signs as are present in diseases of the lungs and heart.

A patient, for example, may complain of certain symptoms, and may present

* *Lancet*, October 2, 1886.

such signs as a flushed face, a high temperature, quickened pulse and respiration, but if, on examination of the chest, nothing definite be discovered, it is nevertheless common to state that these are no "physical signs."

To recapitulate here all the signs which may be present in conditions of disease of the various systems of the body would entail repetition of much that is stated elsewhere and would serve no useful purpose.

Regions of the Chest.—For convenience of description the chest is divided into certain regions, but, as the terminology is somewhat variable, it is best in all cases to indicate the position of any physical sign by reference to certain vertical lines and a given rib or interspace.

The vertical lines are as follows:—(1) The mid-sternal line, (2) the nipple line, (3) the anterior, mid and posterior axillary lines, (4) the posterior scapular line (vertebral border of the scapula), (5) the vertebræ. Other terms are used by some writers, but they are rarely employed in practice. The normal position of the cardiac apex is thus described: "In the fifth interspace one inch within the nipple line."

The following regions are commonly spoken of without their boundaries being accurately defined:—

Anteriorly.—The supra-clavicular, the infra- or sub-clavicular, the mammary, and infra- or sub-mammary regions.

The supra-sternal notch, the upper and lower sternal regions.

Laterally.—The axillary and infra-axillary regions, or upper and lower axillary.

Posteriorly.—The supra-spinous fossa, the infra-spinous fossa, the interscapular region, and the base.

For the relations of the lobes of the lungs to the chest wall, the reader is referred to the article on PHTHISIS, LOCALIZATION OF LESIONS OF.

Regions of the Abdomen.—The abdomen is divided into nine regions by the intersection of vertical and horizontal lines, the former drawn from the eighth rib to the centre of Poupart's ligament, the latter on a level with the lowest point of the costal arch and uniting the anterior superior iliac spines. The central regions are from above downwards, the epigastrium, the umbilical region, and the hypogastrium, on either side are the hypochondrium, the lumbar region, and the iliac region.

The examination of the lungs, heart and abdomen is conducted in the follow-

ing order:—(1) Inspection, (2) Palpation, (3) Percussion, (4) Auscultation, (5) Mensuration.

It may be confidently observed that, no matter how experienced the examiner, it is rarely advisable to depart from this order, as so doing may entail the necessity of recommencing the examination when half finished.

As already stated, all these subjects, except the first, are described under their proper headings.

INSPECTION.—This preliminary step, although much neglected by students, is certainly in importance equal to, if not greater than, any other part of the examination. So much is there to be learnt from inspection, that it is often possible in a case of phthisis, and even in some valvular affections of the heart, by simply looking at the chest to make a near approach to an accurate diagnosis.

Of the Chest.—The patient should be placed in a good light and the observer should stand opposite to him. Attention should be directed to the various points in methodical order.

The condition of the integuments and of the superficial vessels must be noted. The *shape* of the chest is of importance. The normal chest is well proportioned in the various diameters, the sternum has a slight curve forwards, the angle of Ludovici (junction of second cartilages with the sternum) is fairly marked.

In phthisis, on the other hand, the chest may be long and narrow, the upper interspaces wide, and the antero-posterior and lateral diameters diminished; or it may be fairly broad but flat in front. The point of the shoulder may be lower and the supra-clavicular fossa may be deeper on one side than the other, and there may be a depression beneath one clavicle, indicative of shrinking of the corresponding lung. In pleurisy with effusion a bulging of the affected side may be observed.

In emphysema the chest tends to assume a rounded outline, the "barrel-shaped chest," the antero-posterior diameter is much increased, and the sternum arched forwards. In rickets there is often a depression running obliquely downwards and outwards from the mammary regions to the costal margin, giving the transverse section of the chest the shape of a fiddle; with this the sternum may present the typical "pigeon breast." Again, the local bulging, due to an aneurysm of the aorta, may arrest attention on inspection.

Shoemakers often present a depression

of the lower part of the sternum, due to the manner of holding the foot when at work.

Behind.—It is important to notice the position of the scapulae, as any retraction of the upper part of the chest usually manifests itself by a drooping of the shoulder and lowering of the angle of the scapula, which is also seen to be nearer to the vertebral column. The long narrow chest is sometimes termed "alar," from the projecting wing-like position of the shoulder blades, due to the drooping of the shoulders.

Movement.—The expansion of the normal chest is equal on the two sides, and causes an increase in all the diameters. In disease it may, from various causes, be unequal, or absent, the enlargement being effected by the descent of the diaphragm, the chest only moving upwards "en masse."

If there be obstruction to the entrance of air, the intercostal spaces will be observed to sink in during inspiration, generally if the obstruction be in the larynx or trachea, locally if the obstruction be local.

Of the Heart.—The site of the apex beat will be first observed. The impulse may be diffused, and in emphysema is often most obvious in the epigastrium. The precordial region may be bulged in consequence of hypertrophy; this is not uncommonly seen in the case of children with valvular disease. Systolic recession of the interspaces or epigastrium, or even of the ensiform cartilage, may be present. The value of these signs in the diagnosis of pericardial adhesion is discussed under that heading. The heart may be uncovered by the retraction of the left upper lobe, and the apex may be obviously displaced from a variety of causes.

Of the Abdomen.—The condition of the superficial vessels will be noted, and the state of the abdomen as regards distension or retraction. Distension may be general or local. Peristalsis may be observed, and is sometimes indicative of gastric or intestinal obstruction. The attitude of the patient is of importance.

J. K. FOWLER.

PHYSOMETRA.—Distension of the uterus by air or gas. It may occur during labour, or in the puerperal state, or with atresia or blocking of the cervical canal, independent of pregnancy. It is rare, and cases apart from labour are so rare that their existence has been doubted; but authentic cases have been

published. It results from decomposition of a dead foetus, of the liquor amnii, or placenta, or of retained secretions. It is said to occur "in hysterical women." This means that hysterical women have sometimes passed wind from the rectum, and said it came from the vagina. Retention of air in the vagina, and its subsequent expulsion, sometimes with noise, is commoner than physometra, and has been mistaken for it.

Physometra is identified by the resonance on percussion of the distended uterus, and the escape of gas when the cervical canal is opened up.

The *treatment* is that of the condition on which the physometra depends.

PITYRIASIS.—A term formerly attached to various pathologically dissociated diseases of the skin, the most striking clinical feature of which is the presence of fine, branny desquamation or scurf. Thus, *P. simplex capitis* is now known to be a seborrhœa sicca; *P. versicolor* is due to a vegetable parasitic micro-organism, and is therefore now called *Tinea versicolor* (*q.v.*). Although the word had certainly better be abolished from dermatological nomenclature, it is still in general use to designate two diseases, which are therefore described here.

Pityriasis Rosea (vel Maculata et Circinata, Erythema Furfuracea, Roseola Circinata).—A trivial and comparatively rare but interesting affection, first described by Gibert of Paris in 1860, the identity of which has only recently been recognized in this country, and which Hebra even formerly regarded as an unusual form of ringworm of the body. Sometimes there are slight febrile and gastric prodromata to the rash.

Eruption.—This is patchy, and consists of bright pink macules and slightly raised papules, roughly circular or oval in form, which vary from $\frac{1}{16}$ to $\frac{1}{2}$ inch in diameter, and are covered with more or less fine greasy yellow or white scale. They invariably appear first upon the chest, abdomen or neck. Many remain discrete while increasing peripherally, whereas others coalesce to form irregular, gyrate areas, the centre of which is always slightly depressed as compared with the scaly spreading edge, which is also more vivid in colour, the centre becoming a dull yellowish brown. The disease often wanders from the chest and back over the lower part of the neck, abdomen (if not originally in these situations), and down the limbs

as far as the wrists and ankles, but exposed parts, *e.g.*, face and limbs, are hardly ever attacked. The various stages of the disease are usually present at the same time, and considerable patchy discoloration is apt to persist for an indefinite period after its subsidence. Generally, very little or no inconvenience is caused by it, but sometimes it may itch considerably.

The disease occurs in small epidemics, especially in spring and autumn, although it is not demonstrably contagious. It chiefly affects children or young persons of either sex, but has been seen in a patient aged seventy. It undergoes spontaneous arrest in a period varying from a fortnight to two months, its wanderings being apparently but little influenced by treatment. Much in the character of the rash suggests its origin from a micro-organism, but none to which it can with certainty be specifically attributed has as yet been identified.

Diagnosis.—The most important point about the disease is its similarity to papulo-squamous dermato-syphilis, for which it is often mistaken owing to the circinate configuration of the patches, the absence of itching and the subsequent pigmentation. It may also be confounded with *seborrhœa corporis* (*lichen circumscriptus*), *tinea versicolor*, *psoriasis gyrata* or *tinea circinata*, to the separate description of which attention is directed.

Treatment influences its duration very little. Sulphur, carbolic, boracic, and salicylic acids, resorcin and tarry preparations in the writer's hands have all proved inoperative. Calamine and weak tar lotions (*liq. carbonis deterg.* ʒj ad ʒviij) are, however, useful to allay itching. A condition of secondary exfoliative dermatitis may result from its treatment by strong irritants. J. J. PRINGLE.

PITYRIASIS RUBRA.—A name still most usually employed in this country to designate a large and important group of dermatoses to which the term "*dermatitis exfoliativa*" is more generally applied on the Continent; the latter designation is by far preferable, by reason of its greater descriptiveness and comprehensiveness.

The group includes various conditions of skin other than those produced by the exanthemata (especially scarlatina, erysipelas, measles and *rôtheln*) or by drugs (*e.g.*, chloral, belladonna, quinine, *copaiba*), whether primary or secondary to other cutaneous affections, in which universal

or almost universal dermatitis is present, with severe congestion and redness, but with little or no discharge, with slight or considerable infiltration and with profuse and continuous desquamation, either of fine, branny epithelium, or of extensive scales or sheets of epidermis.

From the foregoing it is obvious that the term exfoliative dermatitis is a very wide one, but the disease being thus conceived as an "entity," the following general observations may be made regarding it:—It occurs most frequently between the ages of forty and sixty years, but has been observed in early childhood and at the age of ninety years; it shows a striking predilection for the male sex; it is not hereditary. Arthritic affections—gout and especially rheumatism—strongly predispose to its occurrence, either spontaneously or as an epiphenomenon of other diseases; renal disease and chronic alcoholism do so to a less marked degree. It may supervene upon an eczema or a psoriasis, and may also arise from a lichen, an erysipelas, a *seborrhœa*, an *erythema multiforme*, a *pityriasis rosea*, or even a *dermatitis medicamentosa*. The amount of infiltration of skin varies within wide limits, as does the resulting hardness and the occasional subsequent atrophy or sclerosis of the skin. The amount of sweat secreted also varies considerably in different cases, although frequently it is surprisingly profuse. The characters of the desquamation generally depend upon its locality, that from the face being fine and branny, that from the scalp matted together—owing to admixture with sebum—that from the chest and abdomen in large thin scales and flakes, that from the hands and feet in thick sheets or moulds. As the greatest variety also obtains with regard to (1) the implication of the dermal appendages—hair and nails, (2) the amount of fever, the complications and general constitutional disturbance, and (3) the duration, course and prognosis of the malady, the recent writings of Dr. Brocq of Paris, which analyse and subdivide this extensive and inchoate group of diseases into various constituent "types," have their full justification, and these types, therefore, here receive separate—albeit brief—description. The writer is, however, unable to follow Dr. Brocq in his contention that exfoliative dermatitis is always and essentially a primary, independent disorder, and that the universal extension of an eczema, or of a psoriasis with an assumption of all the peculiar clinical, cyclical and pathological charac-

teristics of exfoliative dermatitis, is, nevertheless, not that disease, but a phase of the original disease. He is also of opinion that Dr. Brocq's writings are calculated to convey a false or exaggerated impression as regards the hard-and-fast delimitations of the various types or subdivisions which constitute the group, perhaps unduly neglecting—or it may be deferring for future study—the investigation of cases not in exact conformity with the types he has formulated, but which, indeed, represent connecting links between them which it is of the utmost value to recognize in order to obtain an harmonious view of the totality and essence of the apparently heterogeneous group.

(1) The relapsing, desquamative scarlatiniform erythema of Féréol represents the mildest form. It is commoner in children and young adults than the others. Its onset is brusque, with high temperature (102° – 104° F.), marked general febrile symptoms, an intense, universal, scarlatina-like redness of the skin without any infiltration, thickening or induration, and frequently even with sore throat. In the course of a day or two the febrile symptoms subside, all redness disappears, and copious general desquamation sets in; at the end of a week or a fortnight recovery is complete. Recrudescences repeating the characters of the primary attack often, however, occur, prolonging the duration of the disease over a month or more. The diagnosis of a first attack from scarlatina is generally difficult, if not impossible, but the subsequent course of the affection decides the point, as relapses invariably occur, often at regular seasonal intervals, especially in spring, when they are usually referable to exposure to cold, or in summer, when attributed to insolation. Sometimes a drug taken internally (especially mercurials) or an irritating external application may determine a first attack, which may be afterwards reproduced in the manner described. The disease never occurs in epidemics, is never infectious, and is never attended with albuminuria. The hair is never affected, but in most cases each attack leaves its mark on the nails in the form of a transverse groove upon them. In a small number of the severest cases the nails fall, constituting a connecting link with—

(2) The universal exfoliative dermatitis of Erasmus Wilson, which is a more frequent and much more serious condition than that just described. It is a

disease of temperate climates, occurring chiefly in warm weather and attacking healthy adult males in the great majority of cases. Although usually primary, it may be secondary to psoriasis, eczema or lichen. Its onset is acute, febrile, the temperature rising to 102° F. or higher. The eruption first manifests itself as erythematous patches, with some scaling, usually situated on the trunk and discrete, but rapidly extending and coalescing to cover the entire surface of the body in a week. The skin is then intensely and vividly red: it is infiltrated from the first, and large, white, imbricated flakes and sheets of epidermis are shed in amazing abundance, or remain attached to the skin only by their upper edge. Itching is usually severe, and scratching is naturally resorted to for its relief. There may be a little oozing from the flexures of the knees, elbows, axillæ and thighs, and in extremely exceptional cases small bullæ have been observed in these situations, suggesting to some writers a link with pemphigus foliaceus; but the rest of the surface is absolutely dry and harsh. Copious sweats are nevertheless observed from time to time. Severe seborrhœa of the scalp is always present. The buccal, lingual, pharyngeal, nasal and conjunctival mucous membranes are often congested, and severe vomiting and diarrhœa are not infrequent, indicating perhaps implication of the gastric and intestinal mucosa. Meanwhile the concomitant febrile symptoms are severe and intermittent in type, an evening rise of temperature to 102° – 103° F. being usually marked. Prostration is a prominent feature, and rapid emaciation occurs. Especially characteristic is the early complete loss of nails both from hands and feet, and of hair from all normally hairy parts; this may occur as early as the fourth week of the disease.

Almost all cases ultimately recover perfectly, the duration of the affection being generally about four months, but it may be prolonged for eight or twelve months owing to repeated recrudescences. Once thoroughly arrested the disease does not recur. Considerable pigmentation may persist for some time after the subsidence of the rash. Lymphangitis, adenitis, abscesses, boils or carbuncles often occur during the course of the disease, or they may interrupt convalescence. Albuminuria and pulmonary troubles are sometimes present in severe cases, especially towards the end of an attack, but they do not necessarily render

the prognosis unfavourable. Among various nervous sequelæ partial paraplegia, incontinence of urine, bed-sores, and functional ocular and auditory derangements may be especially noted.

(3) The chronic universal pityriasis rubra of Hebra represents a more severe and rarer type. Its onset is insidious and afebrile; it is generally primary, but may be secondary to other diseases, especially perhaps to psoriasis. Its spread is slow, but at the end of some weeks it becomes universal. The skin is then red, but not infiltrated or thickened. The desquamated epithelium is in the form of fine, white, branny scurf, which does not adhere to the surface; there is little or no pruritus. Gradually, however, in the course of months, or it may be years, the skin becomes infiltrated, hard and thickened, and when partially emptied of blood by pressure, deep pigmentation may be observed. Later on it slowly atrophies, becoming glossy, thin, yellowish, tightly stretched and often fissured over prominent bony points, as well as retracted round the openings of the orbits and mouth. Marasmus only sets in after years, when ulceration and gangrene may ensue, but death is generally the result of intercurrent tuberculosis or pneumonia. The hair and nails are only affected in the last stages.

(4) The pityriasis rubra pilaris of Devergie, the identity of which has recently been established beyond cavil by the works of Besnier, may here be briefly alluded to, although it is doubtful whether it ought to be included in the group, as its most intimate relationship appears to be with psoriasis. Any form of exfoliative dermatitis may, however, at a certain stage of recovery present a condition closely resembling it in its objective characters, although the clinical history in the two cases is entirely different.

Pityriasis rubra pilaris is an absolutely benign and local disease, unaccompanied by febrile or other constitutional disturbances. It chiefly affects young persons, and its onset is either sudden or gradual. It generally appears first on the face or hands, and other patches soon follow on the body. These may remain discrete or may coalesce; they are of a decided rose or coppery colour, are slightly infiltrated, covered with small, pityriatic scales and present little acuminate papular prominences, due to perifollicular accumulations of epidermic cells. These "epidermic cones" are eminently characteristic round the hair

on the dorsal surface of the first and second phalanges of the fingers and toes and on the backs of the hands and forearms; they never occur on the scalp or pubes. There is always marked seborrhœa capitis, but the hair is not shed; on the contrary, it generally is much increased in quantity all over the body, and the nails grow at a great rate, becoming ultimately like horns or claws. The disease is of quite indefinite duration, but in the long run the patient always recovers.

PATHOLOGY.—Of the intimate pathology of the group of exfoliative dermatitis we know nothing, and mere surmises would here be out of place. The pathological anatomy embraces congestion and dilatation of the vessels of the deeper, but more especially of the superficial longitudinal plexus of the skin, inflammatory leucocytic infiltration of the upper, papillary layers of the corium, great increase in size and depth of the inter-papillary processes of the rete and particularly great increase in thickness of the upper epidermic layers.

DIFFERENTIAL DIAGNOSIS.—This must be established from the exanthemata, medicinal rashes, urticaria, generalized eczema or psoriasis, the early stage of granuloma fungoides, and especially from acute lichen ruber. The foregoing description will suffice for this purpose as well as for a guide to prognosis.

TREATMENT.—Encouragement to vigorous and assiduous treatment is afforded by the more cheering prognosis gained by our present knowledge of the subject over that given by Hebra in his classical work, which, until recently, swayed all dermatological opinions. The value of general medication seems incontestably established. Absolute rest in bed is necessary; the diet ought to be nourishing but easily digestible, including milk, milk puddings, eggs, meat soups, juices or jellies, &c. Alcohol is, as a rule, contra-indicated, but cannot be withheld if there be much prostration. Cod-liver oil is beneficial in many cases of marked emaciation. The regulation of the bowels is of prime importance, and salines or mineral waters are most useful for this purpose. The writer is strongly convinced by personal experience that arsenic is in the great majority of cases absolutely deleterious, its discontinuance in several cases under his own observation having been attended with marked benefit. Some authors, however, consider arsenic useful in the most chronic cases. The writer also has found the eruption

aggravated by ferruginous preparations, whereas quinine has rendered signal service, given in full doses. The promotion of diuresis was strongly advocated by Tilbury Fox, and the subcutaneous injection of nitrate of pilocarpine (gr. $\frac{1}{10}$ — $\frac{1}{5}$ or more, with caution) has lately been advocated by Dr. Stephen Mackenzie; its diaphoretic action is aided by a hot-air bath.

Prolonged warm alkaline or bran baths are occasionally of service in relieving itching and removing scales, but, on the other hand, sometimes increase hyperæmia. Oily applications are more generally useful. The whole body must be swathed in soft linen cloths soaked in the application, the face being covered with a mask. The official linimentum calcis is useful, and the writer can confirm Dr. Crocker's opinion of the value of a liniment thus composed:—*R* Calaminæ $\mathfrak{D}\text{ij}$, zinci oxidi $\mathfrak{Z}\text{ss}$, olei olivæ et aquæ destillatæ ââ $\mathfrak{Z}\text{j}$. A lotion composed of an ounce of glycerole of lead and of glycerin in a pint of water is also serviceable when similarly applied. The patient ought to lie between the blankets and on a spring mattress or water bed.

J. J. PRINGLE.

PLACENTA, DISEASES OF.—

Myxoma of Chorion.—This disease, in its extreme development, is rare; in its slighter forms, not uncommon. There are two forms—(1) Myxoma, in the more literal sense, which is the so-called "hydatid mole," or "cystic degeneration of chorion." This occurs in the earlier months of pregnancy, before the placenta has been differentiated; (2) Myxoma fibrosum, which occurs in the later months, after the placenta has been formed.

Symptoms and Course.—The size of the uterus and abdomen increases out of proportion to the period of the pregnancy. Then follows hæmorrhage, which is often very profuse; it may be so great as to cause death before the expulsion of the mole. The hæmorrhage may begin as early as the middle of the second month of pregnancy; and it has been known to be postponed three or four months beyond the usual term of pregnancy. But, as a rule, hæmorrhage and the expulsion of the mole take place within the first six months. Either with the first hæmorrhage, or with some subsequent attack, some of the small "cysts," which have been aptly compared to "white currants floating in red currant juice," are expelled. This settles the

diagnosis, which cannot be made until these bodies have been seen.

Pathology.—Myxoma of chorion presents itself to us in the form of a loosely-connected heap of bodies looking like white currants, but of more various sizes, attached to one another by delicate semi-translucent threads. As a rule, no trace of a foetus can be found, nor can the foetal membranes be identified. The "cysts," as they used to be called, vary in size from a pin's head to a filbert. They are dilations of the chorionic villi, which, at the swollen parts are degenerated into myxomatous tissue. They are not true cysts, although they collapse when cut into. The condition of the uterus in different cases of this disease is various. Sometimes there is great overgrowth of the decidua, and the disease has been thought to be primarily due to this overgrowth. In other cases the contrary has been found, and the disease has been attributed to the chorionic villi not being able to take root in the badly developed decidua, and so hanging free in the uterine cavity and degenerating in consequence. It has also been attributed to the allantois failing to reach, or apply itself to the chorion. In some cases the diseased chorionic villi grow into the muscular wall of the uterus, splitting it into two parts, a submucous and a subserous part, and approach so near the peritoneum, that only a layer the thickness of paper separates the chorion from the peritoneal cavity. This condition has been termed "mola hydatitosa destruens."

Treatment.—While the diagnosis is doubtful, it is best to stimulate the uterus to contract by ergot and the hot douche. When the diagnosis has been made, the cervix must be dilated with tents (antiseptic precautions being taken), and, if necessary, the finger introduced to break up the mass. Uterine contractions will then usually expel it. Bearing in mind the possibility that the mole may have grown into the uterine wall, all rough usage, such as scraping the uterus or violent manipulation, should be carefully avoided. If hæmorrhage be profuse, the uterus may be swabbed with liq. ferri perch. diluted 1 : 6, or plugged with iodoform gauze.

Myxoma fibrosum affects one or more cotyledons of an otherwise normal placenta. These we find enlarged and studded with smooth, firm, roundish bodies, from the size of a hempseed to that of a hazel nut, arranged in stalks.

These knots consist of a vessel in the interior, surrounded by connective tissue resembling the Whartonian jelly of the umbilical cord. Myxoma fibrosum of the placenta may occur with a healthy and well-developed fœtus; often it goes with abortion or premature labour. It cannot be diagnosed before delivery, and therefore cannot be treated.

G. E. HERMAN.

PLETHORA.—A full habit of body. A condition frequently met with amongst those who eat and drink more than they require, and do not take sufficient exercise. Obesity, congestion of the face, sluggish bowels, general lassitude and undue drowsiness are the chief signs of this condition. It should be combated by careful dieting, regulation of the bowels, and the taking of such exercise as the age and other circumstances of the patient permit.

PLEURA, MORBID GROWTHS OF.—Several forms of morbid growth may be found affecting the pleura, but in most cases they occur as secondary to the same kind of growth elsewhere in the body. Lymphadenoma, lipoma, fibroma, fibro-chondroma and fibro-myoma, osteoma, scirrhus and sarcoma have all been found in the pleura. Primary cancer, sometimes described as endothelioma, but closely resembling epithelioma in structure, may sometimes occur. It begins in the endothelium of the small lymph-vessels, and may take the form of multiple nodules, or may aggregate into small flat patches—forms of distribution which are common to all morbid growths of the pleura. A nodule of growth on the costal or visceral surface will often, by direct contact, infect the opposite surface, either with or without inflammatory adhesion.

Fibroid thickening of the pleura may take place to an extent that may simulate the appearance of a morbid growth, but the localized fibroid tumours are generally secondary, and found in association with fibroid disease elsewhere. Secondary growths of the sarcomatous type are often met with in the lung, and hence may appear on the pleura, also when the surface of the lung is implicated. They are generally secondary to sarcoma of some other internal organ, or of bone.

Diagnosis.—Morbid growths of the pleura are so rare as primary affections that the diagnosis of them is almost invariably bound up with that of a similar condition in some other part.

Localized pain, and sometimes superficial tenderness, associated with dullness on percussion, and diminution in respiratory murmur, coupled with increase of vocal vibration, may serve to indicate the presence of a single patch of disease, but these signs are not by any means trustworthy, and must only be regarded in conjunction with the other features and general history of the case. In the cases of general thickening of the pleura, the principal indications are given by the physical signs; the whole of one side of the chest may be very dull to percussion, although the dullness is rarely so absolute as in the case of fluid. Vocal vibration is seldom altogether lost, although it is, as a rule, impaired. On auscultation, the breath sound is very much feeble than on the healthy side; but it is vesicular in character, unless some other condition be complicating the case. The transmission of the voice sound is variously affected, sometimes being increased and at others diminished. The presence of numerous small crackling râles will often be made out, and these, scattered over the whole dull area, are not unfrequently mistaken for evidence of acute mischief in the lung. They are, as a rule, but little affected by coughing, and may persist for a long time without undergoing any marked change. Bearing this fact in mind, their relative importance must be determined by the other features of the case.

Treatment.—Little can be done for these cases, the relief of pain and of any other troublesome symptoms being all that is possible.

E. CLIFFORD BEALE.

PLEURISY, ACUTE (Pleuritis).—Of all the serous membranes that cover the lungs and lining the chest walls is most often the seat of inflammation.

The attack may vary in severity from what is scarcely more than a sharp pain in the side to a most serious and rapidly fatal illness.

Symptoms.—After exposure to cold or wet, or perhaps independently of any definite exciting cause, the patient usually first complains of slight chilliness and pain in the side. The onset may be sudden, but is rarely marked by the severe rigor which commonly ushers in pneumonia, more often by a succession of chills which continue for two or three days.

The temperature quickly rises, and may range between 101° and 103° F. in

the early days of an acute attack. The respiration becomes rapid and shallow; there is a short dry cough; the pulse is frequent and often shows an increase of tension; the face is anxious, and there are signs of severe suffering.

The pain, or "stitch," in the side is aggravated by cough or a deep inspiration, whereby friction is produced between the inflamed surfaces of the pleura; the patient therefore usually leans toward the affected side, and by pressure and gentle breathing endeavours as much as possible to restrain its movements. The pain is usually felt in the lower axillary region, but may be referred to any spot in the course of the intercostal nerves most adjacent to the inflamed area, and even in rare cases to the opposite side of the chest.

On *palpation*, friction fremitus may be felt. *Percussion* may elicit a slightly altered note, but there will be no marked dulness. On *auscultation* the respiratory sounds are weak from the deficient expansion of the lung, and a friction sound is usually audible, but this may be absent, especially when the diaphragmatic pleura is alone involved. The disease may not advance beyond this stage, the temperature falling, pain in a few days ceasing, and the friction sound disappearing owing to the adhesion of the inflamed pleural surfaces.

More often, however, when the onset has been acute and the general symptoms severe an effusion of fluid of varying amount takes place.

This is usually followed by some amelioration in the patient's condition, the pain being less acute and the breathing easier than in the earlier stage of the disease, but should the fluid continue to increase dyspnoea may again become urgent.

The Signs of Pleural Effusion are generally first discovered at the base of the chest owing to the gravitation of the fluid and of any solid particles it may contain.

Inspection may reveal an apparent bulging of the affected side, although this is more often due to a rounding of the outline than an increase in the semi-circumference. Fulness of the intercostal spaces is a sign rarely present unless the fluid be purulent or the tone of the intercostal muscles lost owing to marked general prostration and wasting; it is on the whole more often seen in children than in adults. If the effusion be considerable and of long standing, the chest wall may be cedematous

and the superficial veins filled with blood. The heart may be seen to be beating away from its normal position.

On *palpation*, the vocal fremitus over the area of the effusion will be diminished or absent, and the heart will be found displaced towards the sound side to a degree varying with the amount of the effusion, the displacement toward the right, however, being usually more obvious than towards the left for an equal amount of effusion.

On *percussion* over the area of the effusion, resonance will be much impaired or there will be absolute dulness. The note yielded by a large effusion is more completely toneless than that elicited from consolidated lung, and the sense of resistance is greater.

The upper line of dulness is usually curved, the highest point being in the axilla, whence it slopes downward to the spine behind and across the median line in front where the dulness from fluid and displaced heart merge.

A tympanitic percussion note (skodaic resonance) is commonly present beneath the clavicle above the level of the effusion, if the latter be moderate in amount and the upper lobe of the lung be healthy.

On *auscultation*, the breath and voice sounds are generally weak or absent over the dull area, but the presence of tubular breathing and whispering pectoriloquy does not exclude the diagnosis of pleural effusion or prove that in addition to the pleurisy the lung is consolidated, as, under certain circumstances, the laryngeal sounds are well conducted through the fluid.

A natural result of the accumulation of fluid within the pleura is a partial contraction or complete collapse of the lung, which, receding towards its root attachments, may lie in contact with the mediastinum or spine. If in the latter position, the laryngeal sounds conducted through the larger bronchi, which, owing to the thickness of their cartilages, still remain patent, may be distinctly audible along the spine and may suggest a diagnosis of pneumonia.

If pleural adhesions over limited areas existed prior to the attack, the lung may be held in partial contact with the chest wall, and may act as a conductor of the laryngeal sounds to any point. About the upper level of the fluid a friction sound may be audible, and the voice sounds sometimes present a peculiar bleating quality, to which the term *ægo-phony* is applied. This sign is usually

most marked about the angle of the scapula in cases of moderate effusion. Over the opposite lung, if it be healthy, the breath sounds will be puerile in quality.

A loud systolic displacement murmur may be audible over the base of the heart when the effusion is considerable, and it may be audible at the apex also; this sound will disappear with the absorption or removal of the fluid. In the former case it is believed to be due to the displacement of the aorta and pulmonary artery.

Measurement may prove the affected side to be enlarged, but a cytometer tracing of the chest gives the most trustworthy evidence of any change in its size or shape.

Displacement of Organs other than the heart and lung may result from an effusion into the pleural cavity, but probably does not occur until there is a positive pressure within the thorax (Powell); the liver, stomach and spleen will then assume a lower position, and the displacement of the diaphragm is an important sign of positive intra-thoracic pressure, and indication of the necessity for paracentesis.

After a moderate amount of fluid has been effused, the temperature in favourable cases falls, the general symptoms improve, and the process of absorption commences. This is marked by a gradual diminution in the dulness of the percussion note, by the return of the breath sounds, and by the expansion of the lung. The friction sound which during the period of effusion disappeared, again becomes audible (redux friction), and the affected side moves more freely during inspiration; but though the absorption of the fluid be complete, some diminution of expansion, impaired resonance on percussion, and feeble breathing may remain for a time or permanently at the base of the chest. If, however, the case be severe, the effusion may increase to such an extent that the affected side becomes dull on percussion quite up to the clavicle, and the difficulty of breathing extreme—a condition requiring immediate relief.

If the temperature assume a "hectic" type, it may indicate that the effusion has become purulent, but no single sign can be looked upon as pathognomonic of that condition, the only mode of ascertaining with certainty the character of the fluid within the chest being to draw off a small quantity, for which purpose an instrument about twice the size of an

ordinary hypodermic syringe is the most useful.

Under the following circumstances, however, it is very probable that the fluid is purulent:

(1) When the pleurisy is part of a general disease of a septic nature, or

(2) Probably due to the escape of septic material into the pleural cavity.

(3) If there be sweating, rigors and marked emaciation; and

(4) The temperature assume the "hectic" type.

(5) If there be bulging of the intercostal spaces and œdema of the affected side.

Paracentesis may be required by the following conditions:—

(1) Urgent dyspnoea, palpitation or retching.

(2) Evidence of engorgement of the opposite lung.

(3) When the fluid has accumulated with great rapidity.

(4) When the dulness extend up to the second rib in front, and there is no skodaic resonance beneath the clavicle.

(5) Displacement of the diaphragm and abdominal organs, showing the existence of positive intra-thoracic pressure.

(6) When there be no signs of absorption of the fluid after a period of from two to three weeks from the commencement of the illness.

(7) If the fluid has been ascertained to be purulent.

Diagnosis.—The diagnosis of pleural effusion may be very simple, or present difficulties such as can only be solved by an exploratory puncture. In the early stage the diagnosis may be rendered difficult by the absence of a friction sound; this is especially likely to occur when the diaphragmatic pleura is alone involved. In the latter case, the presence of severe pain, high fever, and extreme respiratory distress would point to the true nature of the disease. The various painful affections of the chest wall, being unaccompanied by friction sound or fever, do not usually give rise to much difficulty. Close attention to the position of the heart will generally lead to a correct diagnosis; but when its displacement is prevented by previous adhesions, the most experienced may fall into error. Solid growths and a thickened pleura usually transmit the vocal vibrations, to some extent, whilst consolidation of the lung is rarely attended by a degree of cardiac displacement in proportion to the amount of dulness. Errors are not infrequent in the rare cases where

although a pleural effusion is present, the laryngeal sounds are distinctly audible over the dull area. Here, again, the position of the apex beat of the heart is the most trustworthy guide. Acute pneumonia, with fibrinous exudation into the larger bronchi (massive pneumonia), and the moderate degree of pleural inflammation which usually accompanies that condition, give rise to physical signs closely resembling those of pleural effusion; but by attention to the points already insisted upon, error may usually be avoided. If doubt still remain, no harm is likely to result from an exploratory puncture with a fine aspirator needle if it be clean, even should a growth or a thickened pleura or solid lung be struck instead of the expected fluid. If the fluid withdrawn be blood-stained, it must not be hastily assumed that the case is one of malignant disease or tubercular pleurisy, as a hæmorrhagic effusion is occasionally met with in simple pleurisy.

Pathology.—The pleura reacts to inflammation like any other serous membrane, and the changes which occur are in all respects similar. The early stage is one of hyperæmia and engorgement; then the glistening surface becomes dull and lymph is effused, and forms a thin coating to the membrane. New vessels extend from the pleura into the exudation, which consists of fibrin, leucocytes and serum, and shows a marked tendency to coagulate, semi-solid masses sometimes forming, and either floating in the fluid or sinking to the base of the cavity. Coagulation is promoted by a relative excess of fibrin, and retarded by an abundance of leucocytes; if these latter be in great excess, and have lost their vitality, the effusion may not coagulate at all, and will then assume the characters of a collection of thin pus. This is especially likely to occur if any septic element be present in the effusion. Adhesion of the inflamed surfaces is the natural mode of termination of pleurisy, and may take place either before any fluid has been effused or after its absorption or removal. From various causes the absorption of the effusion may be incomplete; if so, provided the effusion be aseptic, the solid portions may undergo fatty degeneration, leading to the formation of a caseous looking mass, which may ultimately become calcareous.

The fluid, if unabsorbed, may become loculated by adhesions; it tends after a time to become inspissated.

Ætiology.—It is probable that expo-

sure to cold, and wet, and a chill are not so commonly the cause of pleurisy as is generally supposed, and although in many cases little that is more definite can be made out from the history, post-mortem experience teaches that in the majority of cases there is some distinct cause for the attack. The attack may be due to local or general causes. Amongst the former, injuries, fractures of the ribs and strain of the chest wall constitute one class. In another group may be included all cases where the inflammation is set up by the escape of some material into the cavity, such as from a bronchial gland or a softening nodule in the lung; the latter, though tubercular, sometimes giving rise to a simple pleurisy. Cancer of the œsophagus again may give rise to simple pleurisy. Inflammation may extend from the pericardium or peritoneum to the pleura, and *vice versa*; and it may be secondary to various diseases of the liver. Disease of the spine or ribs may involve the pleura and cause inflammation. But in the majority of cases the affection is secondary to disease within the lung—*e.g.*, pneumonia, phthisis, or other pulmonary lesion.

Among the general causes septic conditions, such as pyæmia and septicæmia, and diathetic states, as gout and rheumatism, may be mentioned. Serous membranes are especially liable to be inflamed in the various forms of Bright's disease. Pleurisy may occur at any age, and at none is there either exemption from, or special proneness to, the affection.

Treatment.—Rest in bed and a liquid diet are essential measures in the treatment of a case of acute pleurisy. The pain may be relieved by linseed poultices, changed every two hours, leeches, or a blister or a subcutaneous injection of $\frac{1}{4}$ or $\frac{1}{2}$ grain of morphine. Strapping the affected side, as recommended in the treatment of "dry pleurisy," is sometimes efficacious if the pain be only moderate in degree, and the attack of a subacute character. The bowels should be freely acted upon, and the action of the kidneys and skin promoted by the administration of digitalis, nitrous ether, acetate and nitrate of potassium, and liquor ammonii acetatis. The use of aconite and antimony, and the inunction of mercurial ointment, is strongly recommended by some writers as of service in the early stage of pleurisy. The temperature is rarely sufficiently raised to require the adoption of antipyretic measures. Opium in some form may be

necessary if the patient be sleepless. When effusion has occurred, if the temperature remain high, the same line of treatment should be continued for at least a fortnight, no operation for the removal of the fluid at this period being as a rule advisable. Should the temperature fall, the use of counter-irritation to the side by means of iodine or blisters, and the administration of iodide of potassium and quinine is advisable.

Paracentesis having been decided upon, the operation may be performed with either the siphon-aspirator or a trochar and cannula; the former instrument is generally preferred. It is important to draw off the fluid slowly, as the lung is then more likely to expand, and the chances of a further effusion of fluid taking place are thereby diminished. The site to be chosen for puncture will depend upon the position of the fluid; but in the absence of special indications, the sixth interspace in the mid-axillary line is generally to be preferred. It is essential that the admission of air into the pleural cavity be prevented, and that the instruments be scrupulously clean, as neglect of these precautions may result in the conversion of a serous into a purulent effusion.

The pain of the preliminary incision of the skin of the puncture will be diminished by holding a piece of ice dipped in salt to the spot for a short time, freezing it with ether, or a few drops of a 6 per cent. solution of cocaine may be injected subcutaneously. It is well to draw off as much of the fluid as possible unless very severe cough, a sign of the expansion of the lung, be induced, as, although in some cases the withdrawal of a small quantity is followed by rapid absorption of the remainder, this result cannot be depended upon. When the flow has ceased, the skin is grasped between the fingers, the needle withdrawn, and a pledget of cotton-wool soaked in collodion applied, covered with lint, and held in position with a piece of strapping. If the first tapping be "dry," it will be advisable to puncture in another spot should there be clear indications of the presence of fluid.

Should the fluid re-accumulate, a second or third aspiration may become necessary; if, however, recurrence take place after repeated tapplings, it is generally advisable to allow the fluid to remain, as absorption occasionally occurs after long intervals, and if not, a simple serous effusion does little or no harm, whilst from the thickening of the visceral layer of the pleura which usually follows

the prolonged presence of fluid in the cavity, it is very unlikely that at this period the operation will be followed by re-expansion of the lung.

E. CLIFFORD BEALE.
J. K. FOWLER.

PLEURISY, DRY.—In this form of the disease the exudation from the inflamed surfaces of the pleura remains dry, little or no fluid being effused. It is especially common in rheumatic and phthisical subjects, and is probably in many cases of tubercular origin. It may precede, by a long interval, the development of pulmonary tuberculosis. Local injury and a chill are also amongst the exciting causes. The onset is rarely well marked, and the affection is often only discovered on examination of the chest, the patient's symptoms giving no clue to its presence, or slight pain in the side increased with the respiratory movements, may suggest the nature of the illness. Fever, if present, is usually only moderate in degree, and the general symptoms are not severe. There may be a short cough without expectoration.

On palpation, friction fremitus is often felt, and on auscultation a dry rubbing sound will be audible, often over a considerable area. This may soon disappear, or, as not uncommonly happens, may persist for a long time without causing much discomfort.

The most common site of the friction sound is the lower part of the axilla or infra-scapular region, but it is occasionally audible over the apex of the lung, or beneath the clavicles. Recovery from dry pleurisy occurs through the adhesions of the opposing surfaces of the pleura. Whether this be the invariable result is doubtful; the serous membrane, however does not return to its normal condition, some thickening and opacity inevitably remaining. Probably adhesion is the most desirable termination, as it prevents the recurrence of the affection at any rate in its original site, and a second attack is by no means uncommon.

After adhesion has taken place, creaking sounds may still be audible, and some pain may be felt on deep inspiration.

The best treatment for dry pleurisy is to firmly strap the affected side with emplastrum plumbi spread upon wash leather. The plaster should be cut into strips of about two inches wide and of sufficient length to reach from the spine to the sternum, and the strips, slightly overlapping each other, should be applied

over an area proportionate to the extent of the disease. By this means the movements of the affected side are restrained, the pain is relieved, and adhesion of the inflamed surfaces is promoted. In some cases counter-irritation is of service, for which purpose a blister or equal parts of the tincture and liniment of iodine may be used. The general health must be attended to, tonics and cod-liver oil being especially useful. In phthisical subjects a change of climate is to be recommended.

E. CLIFFORD BEALE.

J. K. FOWLER.

PLEURISY, TUBERCULAR. —

As stated in the preceding article, pleurisy of tubercular origin is very often "dry," but by no means always so, as such a case may present all the characteristics of an ordinary case of pleurisy with effusion, running on it may be to empyema, and terminating fatally, its true nature being only discovered on post-mortem examination. It is highly probable that many cases of pleurisy, which are believed to be of idiopathic origin, are really tubercular.

The *symptoms and physical signs* of tubercular pleurisy, whether dry or accompanied by effusion, do not in themselves differ sufficiently from those which are present in non-tubercular cases to permit of a differential *diagnosis* on those grounds alone. The suspicion of the tubercular nature of the disease generally arises from the family history or the previous history, or appearance of the individual, or from the fact of the presence of tubercular disease in the lungs or elsewhere.

Prognosis.—This is, as a rule, more serious than in simple pleurisy, but there is every reason to believe that, even should considerable effusion occur, absorption of the fluid may take place with complete recovery, and that in rare cases this may again happen when the opposite side is subsequently attacked. The chief reason for gravity in prognosis lies in the fact that, given the presence of tubercle within the body, it is impossible to predict what organs it will attack or to state what are the chances against a general outbreak of acute tuberculosis. As stated in the article on PHTHISIS (*q.v.*), one of the distinctive modes of onset of that disease is by the occurrence of an attack of pleurisy, which in all probability is, in many cases, tubercular.

Morbid Anatomy.—It is highly important to recognize the fact that the pleura may be so completely covered with

exuded lymph as to hide all trace of the tubercle with which the membrane is studded. This is especially the case at the base of the lung, where the affection most often commences. At the margin of the inflammatory changes, however, the granulations may often be observed, but in many cases it is only on separating the lobes and displaying the pleura of the interlobar sulcus that it becomes apparent that the membrane is thickly studded with miliary tubercles. The interlobar sulci are sealed up at an early period of the disease, with the result that there the appearances are faithfully preserved. The fluid, if any be present, may, on microscopical examination, prove to contain bacilli, and in like manner the fluid withdrawn by aspiration during life may also contain the specific organism. In cases of dry tubercular pleurisy the serous membrane is often found to be much thickened and covered with a tough layer of lymph; on removing this, the tubercles may generally be seen.

Etiology.—In the majority of cases the pleura is infected from the lung, but it may be attacked in common with many other organs in a wide dissemination of tubercle.

The writer has observed one case of tubercular pleurisy in an adult, in which careful post-mortem examination of all the organs of the body showed that the affection of the pleura was primary. The bronchial and mediastinal glands may be secondarily affected, and also in some cases are probably the starting-point of infection of the pleura. The peritoneum covering the under-surface of the diaphragm is especially likely to be affected secondarily to the neighbouring pleura, infection spreading through the diaphragm.

Treatment.—It is advisable in these cases to avoid operative interference unless imperatively called for; in other respects the treatment is not essentially different to that already detailed under PLEURISY, ACUTE, and PLEURISY, DRY. Lowering measures are not well borne by tubercular subjects, and a rather more liberal dietary may therefore safely be allowed.

J. K. FOWLER.

PLEURODYNIA signifies "pain in the side" and is usually due to rheumatism of the muscles of the chest wall. As it is often associated with cough, care must be taken to exclude pleurisy or other intra-thoracic disease; the possibility that the pain may be the precursor of shingles must be borne in mind. In

women, pain in the left side is often indicative of ovarian disorder. The pain, when due to a rheumatic affection of the chest walls, may be relieved by the local employment of linimentum saponis co., or, if very severe, by hypodermic injections of morphine. It is, however, generally best treated by fixing the chest with strips of lead plaster spread upon wash leather, applied from the spine to the sternum.

PNEUMOGASTRIC NERVE, DISEASES OF.

—The vagus or pneumogastric nerve, forming, with its fellow, the tenth pair of cranial nerves, according to Sömmering, arises from the medulla oblongata between the origin of the glosso-pharyngeal and the spinal accessory nerves, which are above and below it: its nucleus is situated in the floor of the fourth ventricle near the calamus scriptorius, and on its inner side is the hypoglossal nucleus. After its passage through the foramen jugular it is joined by the branches from the spinal accessory nerve.

The nerve may be affected either at its nucleus of origin or in its trunk, or in the terminal branches.

The disease in which the nucleus is most frequently affected is **BULBAR PARALYSIS** (*q.v.*) in which the neighbouring nuclei of the spinal accessory and the hypoglossal are also involved. It may be mentioned here that all the motor fibres of the vagus to the head and neck are supplied by the spinal accessory nerve. The writer, in conjunction with Mr. Horsley, found that, in the monkey, stimulation of the distal end of the cut vagus nerve inside the skull gave no motor results, whereas the accessory to the vagus produced elevation of the soft palate of the same sides as well as movements of the pharynx and larynx (see *Proc. Roy. Soc.*, vol. xlv.). Inside the skull the nerve is liable to be compressed by tumours, or by an aneurysm of the vertebral artery, or it may be involved in meningeal thickening, whether syphilitic or otherwise.

In the neck, being in the same sheath as the carotid artery, it may be similarly affected by an aneurysm of that vessel, or involved in a ligature, or compressed by glandular tumours in the neck. The frequency with which the recurrent branches, the right in its passage round the subclavian artery, and the left in passing round the arch of the aorta, become involved in the growth of aneurysms is to be remarked, the left being

more often affected than the right, as the aorta is more often the seat of aneurysm than the subclavian artery.

In regarding the phenomena produced when the nerve is divided or compressed, it will be necessary to remember that it contains the depressor fibres for the heart, accelerator and depressor afferent fibres for respiration, the former preponderating, the motor and sensory fibres for the œsophagus, the sensory and some of the motor fibres for the stomach; therefore the symptoms will be due to irritation or paralysis of these fibres according as they are irritated or destroyed.

The chief branches of the nerve are the

Pharyngeal, supplying the constrictors of the pharynx and the levator palati through the pharyngeal plexus, and producing, when affected, difficulty of swallowing.

Laryngeal branches, of which the superior laryngeal is sensory to the interior of the larynx, and also supplies one muscle, the crico-thyroid, while the inferior recurrent laryngeal supplies all the other intra-laryngeal muscles. Paralysis of the muscles of one side of the larynx is a prominent symptom when the trunk of the vagus in the neck, or the recurrent branch is affected, the symptoms being that the voice is hoarse, and coughing impossible, as the glottis cannot be closed, owing to one vocal cord being paralysed (see **LARYNX, PARALYSIS OF**).

Bilateral paralysis is produced in locomotor ataxia—where the spinal accessory nuclei of either side are affected—in diphtheria, and in bulbar paralysis. In the first-named disease paralysis of the abductors is especially apt to occur.

Besides paralysis, the muscles of the larynx are liable to spasm, which is always bilateral, unless brought about by irritation of one recurrent laryngeal nerve. Spasm is produced reflexly, in the form of cough, by irritation of the sensory branches of the superior laryngeal nerve in the larynx. In pertussis there is a series of expirations, followed by a spasmodic narrowing of the glottis during inspiration, and in laryngismus stridulus (*q.v.*) there is closure of the glottis without the muscles of respiration being affected. These two conditions are probably produced both reflexly and centrally (see **LARYNX, SPASM OF**). In epilepsy the cry which begins the fit is produced by tonic contraction of the vocal cords, similar to that of the limbs, and is part of the cortical discharge occurring centrally. In locomotor ataxia

"laryngeal crises" consist of spasm of the glottis, with dyspnoea and stertorous breathing, due to local irritation of the spinal accessory nucleus.

The pulmonary branches of the vagus which are distributed to the muscular fibres of the bronchi are generally believed to play an important part in the production of some of the phenomena of the asthmatic paroxysm, and through other pulmonary branches also, the trophic influence, which it is by some supposed to possess over the lungs, must be exerted.

Cardiac Branches.—In the remarkable cases of persistent extremely rapid action of the heart occasionally observed, these branches are necessarily concerned (see HEART, NEUROSIS OF). The influence of the pneumogastric nerve in the production of angina pectoris is discussed in the article on that subject (*q.v.*).

Besides the œsophageal, of the terminal branches to the abdominal viscera only those to the stomach need be here referred to. The vagus contains the sensory afferent nerves of the stomach and some of the motor, and the severe and persistent attacks of pain and vomiting—gastric crises—which occur in locomotor ataxia, are due to central irritation of the spinal accessory nucleus.

C. E. BEEVOR.

PNEUMONIA (Croupous, Lobar or Pleuro-pneumonia).—The term pneumonia is generally used to denote that form of acute inflammation of the lungs which usually runs a definite course, and tends, as a rule, to complete recovery after the fever which accompanies it has subsided. Other forms of pulmonary inflammation to which the name is occasionally given, are better described as secondary pneumonia, chronic or interstitial pneumonia and broncho-pneumonia.

Symptoms.—The onset of the disease is very frequently traceable to some exposure to chill, especially after violent exercise. A feeling of general malaise is soon followed by definite headache, a well-marked rigor and vomiting. Of these initial symptoms, the vomiting is the most constant, and is present in a large majority of recorded cases, especially in children. When the patient first comes under treatment, which is often not till about the third day, he is found with a peculiarly hot and pungent skin, flushed cheeks and dry coated tongue, and often a small outcrop of herpes about the lips. He usually lies very still

in bed with the head low, and very often flat on the back. The face has generally a flushed and dusky appearance with a slight icteric tinge, but at the same time the eyes are bright and there is an anxious expression of countenance. Respiration is rapid, and tends to become more so as the disease progresses, but the respiratory movements are cautious and shallow, as they are in most cases accompanied by localized pain, due to the inflammation of the pleura covering the affected lung.

The pain is increased by movement, especially by coughing, and sometimes when attempts are made to drink, and hence its speedy relief may become a matter of importance, as thirst is a very common and prominent symptom.

The pulse is regular as a rule, and ranges from 90 to 120, but does not maintain any regular proportion with the number of respirations, the latter sometimes ranging as high as 40 or 60 to the minute, showing a marked change in the normal pulse-respiration ratio of 4 (or 4.5) to 1. The temperature in most cases quickly rises to 103° or 104°, and shows a tendency to remain about the same level during the active period of the illness, the daily fluctuations being sometimes very slight or even absent altogether. In some cases a very irregular temperature has been recorded. More or less cough is generally present. It is always short and guarded to prevent any increase of pain. The expectoration which varies greatly in quantity, and may be absent altogether, is thick and viscid, and adheres closely to the sides of the vessel containing it, and is typically of a dull rusty colour from the admixture of a certain amount of blood. Pure blood is very rarely ejected in the course of pneumonia. The urine is high coloured, *deficient in chlorides*, deposits lithates on cooling, and may contain a trace of albumen. The action of the bowels is generally sluggish, but diarrhoea may occur. Delirium, especially in neurotic persons, is very frequent about the third day of the disease, and may persist as long as the fever lasts. In children, the onset is occasionally marked by convulsions in addition to, or in place of, a rigor.

The symptoms just described are apt to continue with little variation from five to eight days, but the appearance of the physical signs may be delayed for several days after the onset of the attack. In such cases it is probable that the inflammation has begun in the deeper parts of the lung and is slowly travelling to

the surface during the interval. In the majority of uncomplicated cases the disease remains limited to the lobe primarily affected, but in a very considerable number it extends to other parts of the same lung and may attack its fellow.

The recovery from pneumonia is usually rapid and complete, occurring by *crisis* on or about the seventh day of the disease. A sudden fall of temperature and the restoration of the healthy action of the skin mark the occurrence of "crisis," and with these signs the pulse becomes slower, the respiration easier, though still very rapid, and the patient quiet and sensible, often sleeping a great deal, especially if there has been much wakefulness before. The tongue gradually cleans and the appetite returns. "Crisis" usually occurs in the evening or at night, and is not delayed beyond the fourteenth day in uncomplicated cases.

Stages and Physical Signs.—The most characteristic sign of the first stage of pneumonia, that of *engorgement*, is the presence of crepitation audible only on inspiration; this may be preceded by a change in the quality of the breath-sounds which is usually described as an increased harshness with diminished intensity, but it is rarely possible to make a correct diagnosis until the appearance of the characteristic râle. The movements of the chest are shallow, and the expansion of the affected side diminished. The percussion note may have a somewhat tympanitic character, and the vocal fremitus is increased. The second stage, *red hepatisation*, is marked by dulness on percussion over the affected area, which may be the whole of one lobe, the right lower lobe being the most common seat of the disease, and the presence of high pitched tubular or "whiffing" bronchial breathing, a sound which closely resembles that heard on auscultation over the larynx in health. The dulness is rarely so absolute as that produced by the presence of an effusion into the pleural sac. Vocal fremitus is usually increased but may be quite absent if the larger bronchi, as sometimes happens in very acute cases, are filled with a solid fibrinous exudation continuous with that in the alveoli and smaller tubes. This is a condition likely to be mistaken for that of pleurisy with effusion. Crepitation may persist if the inflammation continue to spread, but is usually only heard in the earlier stages, and

before the lung has become completely solidified. The voice-sounds are altered and intensified to bronchophony or pectoriloquy, but they may at times acquire a peculiar nasal twang which is not heard over the trachea. A friction sound is often audible, but is very frequently absent, even when a considerable amount of pleurisy exists. Measurement may show the affected side to be slightly enlarged. The spleen can sometimes be felt and is usually increased in size. All these signs may persist during the acute stage of the attack. The third stage is that of *grey hepatisation*. The physical signs during this stage do not differ essentially from the above, and the presence of the condition can only be inferred from the severity of the constitutional symptoms and the non-occurrence of a "crisis."

The crisis is, as a rule, followed by the stage of *resolution*, which is marked by the presence of coarse liquid and bubbling râles (redux crepitation) audible with both inspiration and expiration, indicating that softening and absorption of the effused products is in progress; the bronchial character of the breathing becomes less and less marked and the sounds gradually return to the normal, although weeks and even months may elapse before the recovery of the lung is complete.

Course and Termination. — Recovery may be delayed, the temperature gradually declining (lysis) and certain sequelæ, leading to more serious results, may follow. The slower form of recovery is marked by the same symptoms occurring in gradual succession, but in many such cases it is not continuous. In old persons and those whose health has been previously broken down by any cause, such as alcoholic or malarial poisoning, recovery may be thus retarded, and a series of secondary changes may ensue, dependent in great measure upon the severity of the inflammation and upon the constitutional peculiarities of the patient. It is doubtful whether simple acute pneumonia ever terminates in abscess, but cases are on record in which, after a basal pneumonia, the lung has failed to recover itself, and has become the seat of a cavity, and, to all appearances, the starting-point of phthisis, of which the signs subsequently develop elsewhere in the lung. Such cases are in all probability tubercular from the first, and although the pneumonic process may have been predominant at the

outset, the specific character of the disease will have shown itself in the later stages, and have led to the disintegration of the inflamed patch of lung and the extension of tubercular disease to other parts.

In a few rare instances absorption is only partial, small islets of inflamed tissue being left which undergo disintegration. Such a change might be indicated by the presence of elastic tissue in the sputa; the condition, however, is rarely met with except in association with phthisis, and is probably to be attributed to specific influences.

The whole or part of a pneumonic patch in a lung may become gangrenous, but the condition is rare. It is probably caused by plugging of vessels in the inflamed area and around it, whereby the blood supply is cut off. The symptom indicative of this condition is an unmistakable fœtor, which resists the influence of all deodorising drugs. If the gangrenous area be very limited, it may ultimately be expectorated, but the occurrence of gangrene is generally the forerunner of a fatal termination.

Pneumonia is always a serious complication, especially when it supervenes upon renal disease or diabetes, œdema of the remainder of the lung being apt to ensue, a condition generally fatal in this connection.

Complications.—Inflammation of neighbouring serous membranes is very prone to occur. Some degree of pleurisy is present in nearly all cases of pneumonia, although much effusion of fluid is comparatively rare. Pericarditis is a most serious complication, especially in children. Local peritonitis may also occur.

Inflammation of the mediastinal tissues and enlargement of the mediastinal and bronchial glands have been frequently noted. Hyperpyrexia may at times supervene in the course of a case and then becomes the most serious condition, requiring active antipyretic treatment. Purulent meningitis occasionally occurs as a complication of acute pneumonia, and to it are probably attributable the irregular paralytic symptoms which sometimes complicate the most serious cases.

Prognosis.—Uncomplicated cases of pneumonia recover completely as a rule, even though they may have apparently approached very near indeed to a fatal termination. This is especially the case in young patients. To this rule, however, there are many exceptions, and

hence the prognosis should always be guarded. In the complicated cases, where pneumonia attacks intemperate persons or those who are the subjects of morbid conditions elsewhere, and especially of renal disease, the issue is more often fatal. Some doubt has, however, recently been thrown by carefully prepared statistics, upon the generally received statement that pneumonia is especially fatal in intemperate subjects. Marked delirium of the type of delirium tremens, hyperpyrexia (105° – 106° F.) extreme frequency of the pulse and respirations, the involvement of both lungs in the disease, the development of other acute inflammatory affections, such as pericarditis or meningitis, are all signs of danger, and, should œdema of other parts of the affected lung set in, the prospect is still more unfavourable.

Pathology.—The inflammatory changes taking place in a lung, the site of acute inflammation, may be roughly divided into three stages. The first stage is marked by hyperæmia and engorgement of the part about to be attacked; the second, by active inflammation with rapid effusion of fibrinous material into the pulmonary alveoli; and the third, by the various changes that may occur in the material thus effused and in the affected tract of lung tissue itself.

The pathological changes in the first stage of an acute pneumonia may sometimes be seen on the confines of an area in a more advanced stage of the process. The affected part is engorged and dense, but it is not solid. In the second stage, the lung is found to be almost entirely consolidated, and the layer of visceral pleura covering it is seen to be dull and dry and covered with a thin layer of lymph, which, on being stripped off, displays the injected surface of the pleura beneath. On section, the consolidated area appears of a dirty brick-red colour, the surface is granular, and exudes a yellowish-red fluid. It is airless, and sinks in water. Pressure with the finger easily pits the surface or breaks into the middle of the patch. Solid fibrinous cylinders of exudation are seen projecting from the small bronchi. This condition, generally described as red hepatisation, is brought about by effusion of fibrinous material from the hyperæmic vessels of the vesicular walls into the vesicles. A few leucocytes and many red blood corpuscles are effused at the same time, and as the fibrin coagulates, these are caught in the meshes

which it forms. Some swelling of the alveolar walls and of their epithelial lining takes place at the same time.

The next stage in the process has been called grey hepatisation, from the fact that the consolidated lung becomes yellowish-grey in colour, and is still more softened and friable than in the previous stage. This change of colour is in part due to increase in the number of leucocytes and to fatty degeneration of all the effused cellular elements, and in part also to the enlargement and multiplication of the cells of the alveolar walls, producing pressure upon the blood vessels and obstructing the flow of blood through them, thus rendering the whole tract of tissue more or less anæmic. Some authorities have doubted whether the lung is capable of recovery after this condition has once been reached.

These various stages of the disease may occasionally be found in progress simultaneously in different areas of the lung, so that the surface of a section may present a mottled appearance. The colour of the parts in the stage of red hepatisation varies with the quantity of red corpuscles effused. When the inflammatory process ends in resolution, it has probably reached its maximum intensity before grey hepatization has set in. The epithelial and blood cells then become granular from fatty changes, and gradually break up into a fine granular material, which is re-absorbed or expectorated, some of the colouring matter of the red corpuscles appearing as a red or brown stain in the sputa for some time after the symptoms of inflammation have subsided.

Ætiology.—Acute pneumonia is marked by a course which is very definite, the symptoms and the pathological changes which they indicate being more uniform and constant than is the case in any of the more common febrile diseases. This fact in itself seems to point to the probability that the whole affection is determined by the action of some micro-organism which has a definite and fixed period of activity. The identity of this micro-organism has not yet been demonstrated beyond dispute, although ascertained facts point strongly to two special forms as possibly the specific agents in acute pneumonia. One of these, known as Friedländer's pneumococcus, consists of elongated oval cells provided with a very marked capsule. These pneumococci when cultivated and injected into the lungs of certain animals have, in a large majority of cases, produced acute

pneumonia, the inflamed area containing the same form of micro-organism in abundance. The second form consists of micrococci which always occur in pairs, and are hence termed diplococci; these also have been shown to bear a definite relation to the development of pneumonia in man and certain animals. Their occurrence is not invariable however, and similar forms have even been found in the healthy air-passages, from which fact some observers are inclined to believe that the cocci may be occasional parasites of the normal mucous membrane of the air-passages which find in the inflammatory changes of pneumonia the best nidus for their development. (See Figs. 3 and 5, p. 521).

Many instances have occurred in which pneumonia has been epidemic in a district, and the disease may even recur many years afterwards if the dejects of a previous epidemic be brought to light again, as by the disturbance of soil, foul linen, or old stores. Although the great majority of cases occur singly, it may sometimes happen that the disease runs through a household almost as freely as an ordinary catarrh. In whatever way it may be set going, acute pneumonia usually follows a very regular course if it remain uncomplicated.

Pneumonia occurs most frequently in this country during the latter half of the winter—from January to March. It attacks persons of all ages and of both sexes, but males rather more often than females, and, although those of weak constitution are its most constant victims, yet its effects upon the strong and vigorous are often exceptionally severe. Pneumonia may occur in any part of the lung, but the lower lobes are the parts most commonly affected, and of these the right would seem to be more susceptible than the left. In children, however, apex pneumonia is by no means rare, or the disease may begin about the root and spread to the apex. Cases of bilateral pneumonia are less frequent and are not often simultaneous in their onset. The disease does not of necessity attack a whole lobe at one and the same time, although the inflammatory change is frequently limited by the great natural divisions of the lungs. It does, however, tend to attack large tracts of lung tissue, and is apt to spread beyond its first limits and gradually to extend over a whole lobe. One attack of acute pneumonia, so far from giving immunity from further recurrence of the disease, would seem to render the

patient even more susceptible to a second attack.

A form of inflammation closely allied in its morbid changes to acute pneumonia, may be set up by direct injury or contusion of the chest. The clinical course of the disease in such cases differs in many material points from that of the acute form, and is described in the next article (PNEUMONIA, SECONDARY).

Treatment.—It is important that the natural course of the disease should be interfered with as little as possible; careful nursing is essential, and a sharp watch must be kept for the onset of unfavourable symptoms. The patient must be confined strictly to bed, the bed-clothes should be as light as possible; a liberal supply of fresh air must be maintained in the room. The patient should be disturbed as little as possible, and hence all unnecessary examination is to be avoided and conversation must be prohibited. The daily sponging for cleanliness is best done in the recumbent position. If when the case is first seen the physical signs be not yet developed, it is always desirable to act freely upon the bowels. In rare cases, where the onset of the fever has been very rapid and severe, and before the physical signs of consolidation have appeared, the administration of small (3-minim) doses of tincture of aconite or of tartar emetic ($\frac{1}{10}$ of a grain every hour), will sometimes appear to cut the process short, the fever subsiding almost as quickly as it came on. This treatment, however, if not rapidly successful, should not be persevered with, but may always be tried when the case is seen in a sufficiently early stage, provided that the patient be not very weak. It is most successful in robust patients with a full and resistant pulse.

If these means fail or if the patient be not seen during the early stage, the affected side may be enveloped in a lightly made jacket-poultice of linseed-meal, which should be changed about every four hours, its use being continued so long as active inflammation persists either at its original site or elsewhere. Jackets of spongio-piline may be used for children, but are not so satisfactory as the linseed-meal poultice. Of late years, since more attention has been given to antipyretic measures in the treatment of disease, the use of poultices has in the practice of many physicians been superseded by the application to the affected side, when the temperature

reaches 103° or higher, of ice-water compresses, changed every half-hour. Relief of pain and a lowering of temperature generally attend this mode of treatment, and it is likely to become yet more firmly established in this country. When the disease is subsiding the use of any application can be discontinued, or layers of dry cotton-wool may be substituted for poultices.

The diet should consist of milk and beef-tea only. Alcohol is often of the greatest service, and in severe cases, where there is much delirium, or where the rate of pulse becomes excessive, it may be given in very large quantities, even to the extent of 12, 15, or more ounces of brandy in the twenty-four hours. As the disease progresses, digitalis may be given with advantage if the action of the heart becomes weak or irregular. Chloral may sometimes be required if the patient be sleepless. Such drugs, if they have to be used at all, should be used boldly. Hyperpyrexia should be treated with large doses of quinine (gr. xv-xx), by antipyrin (gr. x-xv), or antifebrin (gr. v-xv), or by the use of cold applications as above described. The action of the bowels should be maintained by saline purgatives with an occasional dose of calomel (gr ij). Local pain is often a serious feature, and may be relieved by the application of ice compresses or three or four leeches to the affected side.

The practice of venesection in acute pneumonia is rarely adopted in this country, although largely employed on the Continent. Cases are to be met with at times in which congestion of superficial veins and general slight cyanosis are present in association with a full and resistant pulse. In such the withdrawal of venous blood undoubtedly gives marked relief, and is sometimes followed by a general diminution in the severity of the disease itself, the range of temperature becoming lower, and the dyspnoea less marked. In most of the less congestive cases, however, the constant application of the jacket-poultice appears to act in much the same way by drawing a large amount of blood to the vessels of a wide surface area. Cough, if severe, should be relieved, as it usually aggravates the pain.

The occurrence of "crisis" is sometimes marked by very decided depression, and the free use of stimulants, such as brandy and carbonate of ammonia, is called for. After the subsidence of the fever it is usually only necessary to keep

up the action of the excretory organs, and to regulate the diet according to the patient's powers of taking food. Tonics, and especially iron and quinine, will aid recovery and convalescence, and a change of air is advisable before the patient resumes his usual habits of life.

The treatment of the cases which do not end in recovery of the lung must depend upon the course which the disease may take in each case. As a general rule, it is mainly necessary to keep up the patient's strength by all available means, relieving such special symptoms as may arise. It is not advisable to attempt the evacuation of an abscess or gangrenous cavity unless its position can be pretty clearly defined, often a matter of very great difficulty. A direct opening and the insertion of a large drainage tube is all that should be attempted, no advantage is to be gained by washing out the cavity. Experience of such cases does not indicate a hopeful prognosis, but the patient is generally saved from the annoyance of the constant evacuation of foul pus by the mouth.

E. CLIFFORD BEALE.

PNEUMONIA, SECONDARY.—

Certain forms of pneumonia are apt to occur as complications of pre-existent disease of some other organ, such as the heart, brain, kidneys or liver. Simple inflammation of limited areas of lung tissue may also be set up by direct injury.

In most of the specific febrile diseases, this form of secondary pneumonia may be met with, but it is especially common in association with typhus and enteric fever; it is also not infrequently a complication of acute and chronic nephritis. Pulmonary apoplexy following embolism may give rise to inflammation of the lung tissue around the infarction, and foreign bodies which may have been sucked into the smaller bronchi will, if they remain, certainly produce inflammatory changes.

A condition of lung closely allied to that of pneumonia is sometimes met with in the course of erysipelas of the face or head. In some cases the disease has apparently spread by direct continuity to the throat and then to the lung, but in others the lung has been attacked independently of the upper air passages. It is marked by acute hyperæmia and effusion of serum and some degree of fibrinous exudation into the lung tissue and is attended, like

erysipelas elsewhere, with considerable constitutional disturbance. Recovery, however, when it occurs, is more rapid than is the case in ordinary pneumonia.

The *symptoms* common to most of the forms of secondary pneumonia are cough, dyspnœa, more or less expectoration of tenacious muco-pus, and very commonly hæmoptysis of varying amount. In addition to the rusty sputa seen in simple pneumonia, there is often a considerable quantity of thick dark blood brought up, sometimes mixed with frothy sputa, and sometimes alone. The blood, which is derived from patches of congestion or of pulmonary apoplexy, may continue to appear for many days after the subsidence of the more active symptoms; it gradually alters in appearance, and becomes of a dark-brown colour, and may in some cases have a peculiarly offensive taste.

The range of the temperature of necessity varies much, but, as a rule, it is not so high as in the uncomplicated forms.

The onset of the pulmonary condition is in all cases much less marked than in the acute disease.

The *physical signs* of the disease are for the most part those of congestion. The entry of air into the affected part of the lung is feeble, the expiratory sound is more or less prolonged, and there may be crepitation or coarse crackling râles audible, according to the stage which the disease has reached. The amount of dyspnœa and pain vary greatly. The patient is usually more restless than is the case in acute pneumonia, and the cough is often very troublesome. When the disease is secondary to one of the specific fevers the symptoms of the two conditions become too mixed for differentiation. The gravity of the pulmonary condition is usually in direct proportion to its extent.

The *course* of the pneumonia will depend in great measure upon the nature and intensity of the disease of which it is a complication. Recovery may be satisfactory when the primary fever itself subsides quickly and completely, but when the latter is prolonged and the patient's strength exhausted, if the case should not end fatally the lung mischief rarely clears up satisfactorily. Septicæmic infection conveyed through a poisoned wound not unfrequently gives rise to a most rapid and dangerous form of pneumonia, which tends to spread through the lung with great rapidity and very commonly leads to a fatal termination.

Pathology.—The actual process of inflammation in secondary pneumonia is much the same as that observed in the acute disease. Its onset, however, is generally more insidious, the consolidation is less complete, and smaller areas are affected.

When the pneumonic patches are situated near the surface of the lung the pleura is very likely to become implicated, causing in many cases more or less pleuritic effusion.

Pneumonia as the result of injury or violence is generally limited to the parts of the lung in the immediate neighbourhood of the lesion. The pleura is almost always affected at the same time, and there is usually a certain amount of blood effused in the vesicular tissue before the inflammatory process sets in. The condition is generally followed by recovery, but the lung often remains scarred, and firmly adherent to the chest wall.

The *treatment* of the secondary forms of pneumonia must be of a more stimulating and active kind than that of the acute form. Brandy and carbonate of ammonia will be required at an earlier stage, and may be used with a freer hand. Poultices should be kept applied to the whole of the affected side. Quinine is sometimes of value, but large doses are required (3 to 10 grains three times a day). In the cases of traumatic origin, however, it is sufficient to keep the patient in as complete physiological rest as possible, using Dover's powder (gr. v, twice a day), if necessary, with that object. In septicæmic cases the only possible treatment is to maintain the vital processes by active stimulation. Strapping the side is advisable where there is much pleuritic pain.

E. CLIFFORD BEALE.

PNEUMOTHORAX.—The presence of air within the pleural cavity.

The condition may arise from—(1) Perforation of the pleura by the breaking down of a tubercular nodule in the lung; (2) the rupture of air-vesicles as in emphysema and from great efforts; (3) the discharge of an empyema through the lung or the chest wall; (4) gunshot and other wounds of the thorax. It may also occur (5) in abscess, gangrene and hydatid of the lung, and (6) after the operation of tracheotomy for diphtheria, and rarely in diphtheria when the trachea has not been opened; also (7) from perforation into the pleura of some part of the alimentary canal.

It has been proved that a very considerable amount of force is required to rupture the visceral pleura in its healthy state; but cases are recorded in which a violent act of straining has given rise to it, though these are extremely rare. In the vast majority of cases the point of rupture will be found to be the seat of some form of acute or chronic disease of the lung, leading to ulceration or sloughing of the pleura immediately in relation with it. Such lesions may be extremely small, and even isolated, and the most usual form which is met with in actual practice is the softening of a tubercular nodule on the surface of the lung. Simple rupture of the membrane, however, is not enough to cause the whole pleural cavity to become filled with air; a certain degree of pressure is requisite to separate the layers of pleura and overcome the elastic tension which holds them together. This force is supplied by the expiratory effort of coughing. In wounds of the parietal pleura the pleural cavity may be laid open to the air, but this is not followed by complete collapse of the lung, as used formerly to be supposed, until the layers of the pleura have been forcibly separated by some other cause.

The entrance of air from any of the abdominal viscera, involves the rupture of the diaphragm, and must be the result of excessive violence. The presence of air, whether it enter through the lung or through an external wound, usually gives rise to an effusion of fluid, which may be either serous or purulent. With the escape of air from a phthisical cavity there is often some effusion of its fluid contents at the same time, and the character of this fluid must materially affect the degree of irritation to which it gives rise. The air thus pent up within the pleura is always more or less altered in its composition, which approaches closely to that of expired air, being rich in carbonic acid. In some cases putrefactive changes may take place, and the air is then found to be charged with a large proportion of sulphuretted hydrogen.

Symptoms.—Pneumothorax sometimes occurs without giving rise to any symptoms whatever, but in most cases its occurrence is very clearly indicated. Sudden and acute pain is generally felt, followed at once by more or less urgent dyspnœa, a sensation of something running down the interior of the chest is very commonly complained of, and the patient may become almost collapsed

from shock. The pulse is usually small, feeble and rapid, and the affected side is sometimes extremely tender. The suddenness of the attack terrifies the patient considerably, and he becomes restless and anxious, frequently changing his position, but generally preferring to sit almost upright. The voice becomes feeble or whispering, and some amount of cyanosis may be present. The severity and duration of the symptoms will depend upon the extent of the disease in the lungs and the amount of healthy lung-tissue left available for respiration. Unless the case is about to end fatally, the more urgent symptoms usually pass off in a few hours, but a greater or less degree of dyspnoea will probably remain for several days.

Physical Signs.—The signs indicative of a general pneumothorax on one side are very definite. The whole side seems to be expanded and more rounded than before, the intercostal spaces are sometimes slightly bulged outwards, so as to be indistinct, and the respiratory movements are absent or greatly diminished. The percussion note is resonant and tympanitic in tone, the vocal vibrations are either absent or else much diminished, and the normal breath sounds are altogether absent. The heart is at once displaced to the opposite side, unless there be strong pleural adhesions on that side or some local disease of the lung. In some cases where a large opening is left through which air can pass freely in and out of the pleural cavity from the lung, amphoric breathing may be present, but this is dependent on the nature of the lesion in the pleura. The conduction of the voice sounds is not constant, being in some cases increased and in others diminished, but pectoriloquy resembling that audible over a phthisical cavity is rarely present. A peculiar metallic ring may occasionally be heard during the act of coughing, and if any fluid be present in the cavity there may be metallic r  le at the same time. The "bell sound" may also be elicited (*see AUSCULTATION*). A pneumothorax localized to any limited area of the pleural cavity by previous pleuritic adhesion is not so easily recognizable. The same physical signs are present as in the more general pneumothorax, but they are apt to be masked by the consonance of other healthy or morbid sounds in the lung-tissue immediately surrounding the affected part.

Additional physical signs are afforded when effusion has taken place, whether the

fluid be purulent or serous. Some amount of dulness is caused in the lower part of the chest, and this may be found to alter in level when the position is changed. Sometimes on listening to the chest and shaking the patient at the same time, very distinct splashing can be heard (succussion splash). As the quantity of the effusion increases, the signs of air will diminish and the hydrothorax or empyema will then become the chief feature in the case.

Diagnosis.—The conjunction of hyper-resonance, absence of the breath sounds and displacement of the heart, with partial or complete loss of tactile vibration, forms a group of physical signs not met with in any other condition. The symptoms of pneumothorax may be present in some cases of phthisis where acute congestion takes place in the last remaining area of healthy lung, but the physical signs will fully serve to distinguish between the two conditions. A very large excavation of the lung, especially if seated about the base, has occasionally been mistaken for pneumothorax, but the resonance is rarely so complete, and there are generally more adventitious sounds and a marked degree of pectoriloquy.

Prognosis.—Re-absorption of the air without the occurrence of any fluid effusion may take place if no septic matter has escaped into the pleural sac. In most cases some amount of fluid effusion follows the escape of air into the pleura, and as this increases the quantity of air is found to decrease. The gravity of any case of pneumothorax must essentially depend upon the extent of lung area which is left undisturbed for healthy respiration. In some cases, as effusion of fluid takes place, the lung becomes pressed upon and rendered incapable of further expansion, but, if the other lung be healthy, the compensatory changes which take place may render it quite sufficient for all the requirements of quiet respiration, whilst the enforced rest to which the diseased organ is subjected, may cause the disease to remain quiescent and the general health of the patient will be improved thereby. The duration of a case of pneumothorax may vary indefinitely from a few hours to a year, or more. In most instances the period is less than a year, but the condition of pyo-pneumothorax occasionally becomes chronic, and may then last for years.

Treatment.—It is not, as a rule, advisable to puncture the chest with a view to

withdraw the air, unless the dyspnoea be extremely urgent and there be immediate danger to life. The collapse and distress are best treated by absolute rest and by the administration of opium in moderate doses. Stimulants should only be given sparingly. Gentle purgation by means of salines is advisable. Dry cupping to the side will sometimes give relief to the dyspnoea in the less urgent cases, and fixation of the side with strong strapping is often useful in the same way. When serous effusion has taken place it is not advisable to attempt the removal of the fluid, especially if the case be one of advanced phthisis of the same side. A considerable amount of absorption of serous fluid is possible even when air also is present in the pleural cavity, and opportunity should always be given for this to take place in every case where it can reasonably be expected. The chances of re-expansion of the lung after the chest has once been opened for the relief of hydro-pneumothorax, are but small. In cases, which are, however, very rare, where the fluid has been shown by exploration to be foetid, free removal of it is advisable, a large opening being made in the chest wall so as to permit of thorough drainage and cleansing of the cavity.

E. CLIFFORD BEALE.

POISONOUS FOOD. — Idiosyncrasy and habit have much to do with the causation or prevention of poisonous effects from various articles of diet; thus certain kinds of fish are poisonous to some, whilst they may be eaten with impunity by others. Although in some countries food is chiefly prized when in a state of decomposition, anything in which putrefactive changes have commenced may prove poisonous; but apart from putrefaction there are other causes of danger. An animal may have been feeding on something poisonous to man. In this way the honey of wild bees or the milk of wild goats has become unwholesome; hares that have been feeding on the chrysanthemum, or pheasants fed on the laurel, are thus rendered unfit for human consumption. Again, the animal may have been suffering from disease—*e.g.*, anthrax, foot-and-mouth disease, pleuro-pneumonia or tuberculosis—and its flesh will then be unfit for food; or its flesh may be rendered poisonous through being impregnated with some medicinal substance administered during life. Sometimes no reason can be assigned for the poisonous symptoms; thus at times

mussels will induce retching, vomiting and an alarming state of collapse. Meat which has become putrid, and sausages under certain conditions, are believed to owe their poisonous properties to the development of certain alkaloids known as ptomaines, which are produced during the decomposition of animal matter. The poisonous symptoms which are sometimes met with in those who have partaken of tinned meats, vegetables, meat pies or fruits are to be explained on this hypothesis (*see* PTOMAINES).

The *symptoms* produced are those of an active irritant poison, violent retching and vomiting, with or without purging, being the most prominent. These may be accompanied by collapse, dilated pupils and a feeble pulse. Such cases sometimes result fatally.

The *treatment* would be the same as in the irritant poisons, the vomiting being combated by ice and iced drinks, and the purging by castor oil and opiates; stimulants, such as champagne or brandy, would probably be needed.

POISONOUS GASES. — 1. *Carbonic Acid.*—This accumulates in pits, wells, mines, fermenting vats, lime-kilns, &c., producing an atmosphere that may be absolutely irrespirable, a person placed in it speedily becoming suffocated, and even in crowded and ill-ventilated rooms the air may become so overcharged with carbonic acid and so deficient in oxygen as to produce headache, drowsiness, giddiness and loss of power, with quickened pulse and hurried breathing. After death the body presents all the outward appearances of death from asphyxia, the blood is dark and fluid, and the venous system engorged throughout the body.

2. *Carbonic Oxide* occurs in combination with the above, notably in charcoal vapour and in coal gas. It is a much more deleterious gas than carbonic acid, a smaller percentage of it sufficing to produce fatal symptoms; headache, giddiness, prostration, insensibility and death from coma being the usual sequence. The characteristic feature after death is the cherry-red colour of the blood and internal viscera. This appearance is due to the fact that the oxide forms a very stable compound with hæmoglobin.

3. *Coal Gas.*—The symptoms produced may vary from the slightest degree of malaise to a fatal coma with stertorous breathing and lividity ushered in by headache, vertigo, nausea and vomiting, and followed by loss of consciousness

and complete prostration. After death the blood is dark-coloured, the papillæ at the base of the tongue are injected, the lungs are light-coloured, extravasations of blood may be found in the spinal cord or its membranes, and rose-coloured patches on the thighs.

Treatment.—In all cases the patient should be at once removed from the polluted atmosphere and subjected to a free current of fresh air; this may suffice to revive him. The inhalation of oxygen may be tried; venesection and transfusion with arterial blood freshly drawn will be necessary in the case of carbonic oxide poisoning and would be beneficial in the other forms of poisoning also; artificial respiration may be performed; stimulants should be freely administered.

POISONS. — 1. Irritant Poisons are such as tend to produce inflammation or actual destruction of the part to which they are applied. In the latter case they are called corrosives; to this class belong the mineral acids, oxalic acid and the alkalies.

Symptoms.—The difference between the symptoms in irritant and corrosive poisoning is one of degree rather than kind. In irritant poisoning the symptoms may not come on at once; in corrosive poisoning they almost invariably begin immediately the poison is taken into the mouth. Most of the metals are irritant poisons. The more important of them will be found treated of under their respective headings. The vegetable irritants are elaterium, gamboge, savin, hellebore and ergot, whilst cantharides and certain kinds of foods must also be ranked amongst the irritants.

Corrosive Poisons.—The symptoms in the most severe form come on at once, and consist of a sour taste with burning pain in the mouth, throat, œsophagus and stomach, with eructations and vomiting of black frothy blood-stained matter. In the case of sulphuric or nitric acid there may be brown or yellowish stains about the lips, the mucous membrane of the mouth and tongue may become white and shreddy, the breathing is laboured, and there may be hoarseness especially when hydrochloric acid or ammonia has been taken. The vomiting is constant and the pain in the abdomen intense, there is also extreme thirst, constipation, tenesmus and dysuria. The pulse becomes exceedingly feeble and the skin clammy.

In the less severe cases where an irritant or only a small quantity of a corrosive has been taken the symptoms are less severe, there is not so much collapse and there is usually diarrhœa. Even when the patient survives the immediate effects of a corrosive poison he is liable to die at a later period from stricture of the œsophagus, and this is especially the case in poisoning by the alkalies. The intellect is generally unaffected in irritant poisoning, but convulsions or coma may be present at the last.

Post-mortem Appearances.—The changes will be most marked in the stomach and œsophagus, but lesions may be found more or less throughout the whole alimentary canal from the mouth to the anus. They may vary from the slightest degree of redness through all stages of inflammation to ulceration or even perforation, the stomach being invariably the part most affected. Where perforation has occurred some peritonitis will be found, but this may be present especially in corrosive poisoning without any perforation. In sulphuric acid poisoning the contents of the stomach and intestines will be black from altered blood, and in all severe cases of irritant poisoning blood will probably be found in the stomach or intestines. Sometimes, especially in the case of some of the metallic poisons, the large intestine will be affected whilst the small escapes. The other viscera may show signs of inflammation.

The *treatment* of a case of irritant poisoning resolves itself into an attempt to assist nature in her efforts to get rid of the poison, and in an endeavour to neutralize by antidotes what cannot be expelled. Vomiting is a constant symptom, and it should be encouraged. Where there is no contra-indication, the stomach should be thoroughly washed out with the stomach-pump until it is certain that no poison remains there. This cannot, however, be adopted in any case of corrosive poisoning, and it is also inadmissible in many of the metallic irritants. When there is no reason to fear ulceration of the stomach or œsophagus, emetics may be used if the vomiting be not sufficiently free. Of these, ipecacuanha in 20-grain doses or sulphate of zinc in 30-grain doses are the most reliable, or apomorphine may be used hypodermically (dose, gr. $\frac{1}{20}$ – $\frac{1}{10}$). Large draughts of tepid water or mustard and water will often prove efficient as an emetic where more active measures are contra-indicated, or the fauces may be tickled with a feather; but in the case of the corrosive

poisons not even these measures may be tried.

The best antidote for the mineral acids is carbonate of magnesia, but any of the alkaline bicarbonates may be used, or even chalk and plaster from the ceiling failing anything else. They should be given mixed with water, milk, or gruel, the object being to neutralize and dilute the poison as speedily as possible, for it is only when in a concentrated form that these poisons act as corrosives.

In the case of the alkalies, vinegar and water or lemon juice would be the best antidotes, or olive oil may be given in large doses. The antidotes to the metallic poisons will be found under their respective headings. The rest of the treatment would be symptomatic, the chief dangers being perforation of the stomach and peritonitis; the patient should therefore be kept in bed till all the irritant symptoms have passed off, and be kept on a light diet of milk, gruel, broth, &c. Opiates should be freely given, both by the mouth and hypodermically if there be much pain, and leeches to the epigastrium may be necessary. The dyspepsia or stricture of the œsophagus that might result from corrosive poisoning should be treated on general principles.

2. Neurotic Poisons.—Those which produce their effects either chiefly or wholly by their action on the nervous system.

Of these some produce almost instantaneous loss of consciousness and complete muscular relaxation; such are prussic acid, nitro-benzol, and the aniline group. Others produce convulsions or muscular spasms without loss of consciousness—*e.g.*, strychnine. Others, such as digitalis, aconite and carbolic acid, are both irritant and narcotic; whilst others are pure narcotics, the most important being opium, chloral hydrate, belladonna, conium, hyoscyamus and stramonium. The chief of these are separately described, but many of the narcotic poisons so closely resemble each other in their effects and in the treatment required that it will suffice to indicate a few points of difference. For instance, opium causes contraction of the pupils; several of the others, and notably belladonna, produce dilated pupils; delirium is a prominent feature of belladonna poisoning, though unknown in the case of opium; flushing of the face, too, so common in belladonna poisoning, is not met with in poisoning by opium.

Post-mortem Appearances.— Nothing

definite is found in cases of narcotic poisoning; congestion of the brain and its membranes is common, and also congestion of the mucous membrane of the stomach, but there is nothing characteristic.

Treatment.—In cases of narcotic poisoning spontaneous vomiting is not the rule, and, as the patient will be unable to swallow, emetics are not likely to be of much service. The stomach should be washed out without delay, and this should be continued until the fluid returned seems as pure as when it was put into the stomach, and is, as far as can be judged, free from any trace of the poison; nothing more will be gained by continuing the use of the stomach-pump after this. If the nature of the poison taken be known, and if there be any antidote, this may be administered by means of the stomach-pump, or preferably, if possible, by hypodermic injection, and in the latter case the treatment might be so commenced. For instance, in a case of belladonna poisoning, hydrochlorate of pilocarpine (gr. $\frac{1}{16}$ – $\frac{1}{8}$) might be injected or a small quantity of morphine. If these methods fail to rouse the patient, it will be necessary to try the effect of cold affusions or flicking the chest or feet with a wet towel; pouring hot and cold water alternately over the head is also a powerful method of reviving persons, and is sometimes effectual. The free use of the induced current, the poles being applied indiscriminately to different parts of the body, will often succeed when other measures fail. Mustard blisters to the calves, epigastrium or nape of the neck may be tried, and, if other treatment fail, artificial respiration, either by Sylvester's method or by galvanization of the phrenic nerves, should be tried. In a severe case these various measures will require to be persisted in for some hours before recovery is assured, and sometimes they will fail to arouse the patient from his coma. When the patient has been so far roused as to reply to questions, some hot strong coffee should be administered, which should aid in further rousing him, and the patient must then be kept moving about to prevent him from again becoming comatose, the greatest care being taken to avoid producing exhaustion or cardiac failure. Should he relapse, as is not infrequently the case, the treatment must be commenced over again, with the exception that the stomach-pump will not be required; but it must be remembered that the relapse may be due to exhaustion, and it would be well there-

fore, in all cases where such active treatment as is above described has been prolonged, that as soon as the patient is aroused he should be given strong beef-tea and a little brandy, either by the mouth or rectum. The inhalation of nitrite of amyl or of the vapour of ammonia through the nostrils may be useful when signs of returning consciousness begin to appear, but not before. The after-treatment does not call for special description.

JOHN ABERCROMBIE.

PORTAL VEIN, DISEASES OF.

Thrombosis.—The formation of a clot in the portal vein is generally secondary to compression from cirrhosis or the presence of tumours, abscess, &c.

Symptoms.—The symptomatology of this rare affection is not very definite. It may give rise to hæmatemesis, diarrhœa, bloody stools, ascites, enlargement of the spleen, diminished secretion of urine, and enlargement of the abdominal veins.

Its *duration* is usually short, and it almost invariably terminates fatally.

Morbid Anatomy.—In recent cases the liver is simple anæmic. In cases of longer standing it is atrophied, sometimes granular and anæmic.

Treatment is powerless to remove this condition and can only be palliative.

Inflammation (*Pylephlebitis*).—Inflammation rarely occurs as a primary condition in the wall of the vein but results from the extension to it of some neighbouring suppuration, but cases of obscure origin have been observed in which no such cause could be found.

Symptoms.—The clinical picture of this affection is that of septicæmia with abdominal pain. Rigors, followed by heat and sweating, great prostration, rapid emaciation, swelling of the liver and spleen, jaundice, scanty dark-coloured urine, diarrhœa, coma, delirium, convulsions, suppression of urine, and death. There may be generalized peritonitis.

The *duration* may vary from a few days to several months, but is usually about fourteen days.

Prognosis.—The condition is invariably fatal.

Morbid Anatomy.—The vein and its sheath are reddened, thickened and infiltrated with pus; on transverse section its lumen gapes, and on being slit up the intima is swollen, greyish-yellow and often ulcerated in places. The blood in the vein is coagulated and firmly adherent to

the intima. The branches of the vein are filled with pus, and there are numerous small purulent foci scattered through the liver-substance, which is softened, anæmic and discoloured.

Treatment can only be stimulant and anodyne.

Cancer may occur as a secondary condition, giving rise to symptoms exactly resembling thrombosis. The diagnosis must depend upon the evidence of the existence of cancer in the portal area.

Dilatation (*Pylephlebotaxis*) is usually caused by some obstruction in the liver, but in some cases no mechanical cause can be found, and it is suggested that some nervous defect may give rise to relaxation of the wall of the vein.

Calcification (*Chronic Pylephlebitis*).—This is always secondary to thrombosis.

Rupture.—This may result from injury, but Frerichs has described spontaneous rupture of fatty degenerated radicles of the portal vein.

Parasites.—*Distoma hepaticum* and *distoma hæmatobium* have both been found in the portal vein.

Gall-stones have been found within the portal vein, where they had no doubt arrived by a process of ulceration and perforation.

ROBERT SAUNDY.

POST-MORTEM EXAMINATION (Necropsy; Autopsy).

—For the performance of a necropsy a high table should be secured in a good light. The chief instruments required will be a long sharp section knife; a stout cartilage knife; three or four scalpels of varying sizes; scissors, large and small, probe-pointed and sharp; dissecting and bone forceps; a strong-backed saw and a couple of probes.

A careful external inspection should first be made, the natural orifices being examined for the presence of foreign bodies and the escape of pathological fluids. The stature should be recorded, the degree and distribution of rigor mortis, and the presence of discoloration or œdema. An incision into the deep blue patches often found on the trunk posteriorly will determine whether they are ante-mortem extravasations or simply livories.

The Skull should first be examined. The scalp is first reflected by an incision carried vertically over the skull from immediately behind the external auditory meatus to a corresponding point on the opposite side. A horizontal cut

should then be made with the saw completely round the cranium, the line in front being carried above the superciliary ridges, whilst behind a small V-shaped piece of the occipital bone should be left projecting upwards. This serves afterwards to fix the skull cap in its place and preserve the contour of the head. The less the chisel and mallet are used in removing the bone the less likelihood is there of damaging the brain. The dura mater should be left uncut, the skull-cap being forcibly detached from it. The characters presented by the bones forming the inner table should be noted, and the sutures, &c., carefully inspected. In children, in whom the dura mater is usually firmly adherent to the bone, it is convenient to remove both together.

The longitudinal sinus is now examined, and then the dura is divided on each side on a level with the saw cut and turned upwards towards the middle line. The amount of cerebro-spinal fluid and condition of the arachnoid and pia mater having been observed, two fingers of the left hand are inserted under the frontal lobes, and the olfactory bulbs separated with a scalpel from the cribriform plate. The brain being now further raised the nerves and vessels are divided in their order from before backwards; and, the tentorium cerebelli being divided on each side along the petrous bone by scissors, a long thin scalpel is directed downwards and backwards into the spinal canal, so as to secure as low a section of the cord as possible.

The surface of the brain is next inspected, and if tubercle be suspected the Sylvian fissures are opened up and the vessels in the pia mater covering the island of Reil minutely scrutinized.

The Brain is best examined by vertical transverse sections made from before backwards, after the method of Pitres. The first, or pre-frontal, section is carried down $2\frac{1}{4}$ inches in front of the fissure of Rolando; the second, or pediculo-frontal section, is made three-quarters of an inch in front of that fissure and divides the second and third convolutions near their insertion into the ascending frontal convolution. It shows the anterior extremities of the caudate and lenticular nuclei with the internal capsule between them, sections of the three frontal convolutions, of the anterior convolutions of the island of Reil, and of the orbital convolutions at their posterior ends. The third, or frontal section is made at the level of the ascending frontal convolution. It passes through

the middle of the lenticular nucleus, the hinder part of the caudate, the optic thalamus, the external capsule and claustrum, the island of Reil, the convolutions of the temporo-sphenoidal lobe, and nearly the whole of the ascending frontal convolution. The fourth or parietal section traverses the ascending parietal convolution, it passes through the posterior convolutions of the island of Reil and takes the hinder end of the lenticular nucleus and the claustrum. The fifth, or pediculo-parietal section is carried down an inch behind the fissure of Rolando and cuts the posterior extremity of the optic thalamus. The sixth, or occipital section is made a little less than half an inch in front of the parieto-occipital fissure, and exposes the corona radiata of the hinder part of the brain. A vertical antero-posterior incision should now be made through the superior vermiciform process of the cerebellum so as to open the fourth ventricle. The pons, medulla and cerebellum are then divided transversely by numerous sections and the precise situation of any lesion noted.

The brain being removed, the sinuses at the base of the skull may be slit up and examined; the dura must then be stripped off and the bones of the basal fossæ inspected, and any fracture traced. The orbits can be opened by removing the thin papery roof with bone-forceps, and the eye, for most practical purposes, can be satisfactorily examined by making a vertical transverse section of the globe with a sharp scalpel carried a quarter of an inch behind the sclero-corneal junction, the posterior part being removed and floated in water. The roof of the tympanum is likewise easily removed with bone forceps, and the auditory ossicula and membrane examined *in situ*.

The Spinal Cord may be examined either by removing the vertebral laminae from behind or preferably by the "Vienna method" from the front, in the following manner. The thoracic and abdominal viscera having been removed, the body of the fifth lumbar vertebra is first cut away with a strong knife and bone forceps. A strong, specially made chisel, armed with a blunt guide which travels in the spinal canal, is then taken, and with it the pedicles of the vertebrae are successively divided from below upwards, and the bodies being lifted off the spinal canal is exposed. The cord is then carefully removed surrounded by the dura, the latter is slit up in front

and behind, and transverse sections are made at short distances. Portions of brain and spinal cord required for hardening should be placed for twenty-four hours in alcohol and then transferred to a 2 per cent. bichromate of ammonium solution.

Abdomen and Thorax. — A long vertical incision should next be carried from the symphysis mentis to the symphysis pubis. The cavity of the abdomen should be opened, the character and quantity of fluid present noted and the position of the arch of the diaphragm observed.

The sternum should be carefully removed, the innominate veins being avoided in dividing the first rib, and the position of the lungs observed. The pericardium may be opened by an incision carried vertically down its right border, joined by a second at right angles to it, running along the base of the pericardial sac towards the cardiac apex; the flap thus formed should be turned up and the heart exposed.

The Heart is best removed by lifting the apex and dividing first the inferior vena cava, the quantity and character of blood escaping from it being noted; next the pulmonary veins and arteries are severed and finally the superior cava and aorta. The nature of the clot or fluid contents found in each of the vessels should be observed. The heart being emptied of its contents, the competency of the valves to the water test may be tried. The organ should be supported vertically and the water directed into it in a gentle stream. To measure the capacity of the various orifices a graduated cone should be used. The weight of the organ and any degree of dilatation and hypertrophy of the chambers should be then recorded. To examine the auricles and ventricles the heart is laid on its anterior surface with its apex towards the operator. Blunt-pointed scissors are then introduced into the inferior vena cava and an incision carried upwards parallel to the posterior inter-auricular groove and brought out at the superior cava. A second incision at right angles to this, beginning again at the inferior cava and carried to the right along the auriculo-ventricular groove into the apex of the appendix will completely expose the interior of the auricle and show the tricuspid ring. The ventricle may now be laid open from behind by an incision parallel to and half an inch to the right of the posterior inter-ventricular groove; this will

be found to enter the ventricle between the left and posterior segments of the tricuspid valve, the curtains of which should then be examined. To expose the pulmonary valve, the heart must be turned over on its posterior surface. A small ridge of fat will be seen coursing upwards over the front of the conus arteriosus of the pulmonary artery; if now, the apex being still toward the examiner, the scissors be entered into the front of the ventricle beside the anterior inter-ventricular groove and carried upwards immediately to the right of this ridge, it will be found that the instrument has passed precisely between the two anterior cusps of the pulmonary valve. This completes the examination of the right heart.

To examine the left side of the heart the organ should again be placed on its front, the scissors entered at the right inferior pulmonary vein, a vertical incision carried upwards and a second outwards to the appendix, similar to those on the right side. The interior of the left auricle and fossa ovalis can now be completely examined. A knife should next be placed in the posterior inter-ventricular groove and made to cut forwards and to the left, it will then enter the left ventricle between the aortic and posterior curtains of the mitral valve, will split the posterior papillary muscle and leave the chordæ tendineæ of each segment intact.

Finally, to examine the aortic valve the heart should be once more laid on its back and an incision made into the front of the left ventricle immediately beside the anterior inter-ventricular groove. When this cut reaches the base of the ventricle it should be turned at right angles across the inter-ventricular groove and continued upwards in the conus arteriosus of the pulmonary artery. If the scissors be now made to cut between the left anterior and posterior pulmonary cusps it will be found that the aortic valve-ring has been traversed exactly between the right and left coronary cusps. The cuts into the ventricles should not be carried completely to the apex, which thus serves to hold the heart together, like the binding of the book.

The Aorta should be laid open in its entire extent and the presence of atheroma or of fatty degeneration noted, the former change being especially common about the site of the obliterated ductus arteriosus and the origin of the renal arteries.

Pleural adhesions must be dealt with according to their density; if of recent formation, they are usually easily separated by the fingers, but if very firm the simpler way is to strip the parietal pleura from the thoracic wall and remove it with the lung.

The Lungs.—When the lobes of the lung are adherent, the organ is best examined by an incision carried from its outer border directly inwards to the root, for this not only gives the largest sectional surface but also the cut lies in the plane of distribution of the majority of the large bronchi and blood-vessels. Any further dissection can be carried on by incisions at right angles to the first. When the lobes are separate such a section is not easy to make, it is then preferable to enter the long knife in the septum between the upper and lower lobes and examine the former by an incision carried midway between its anterior and posterior aspects; the lower lobe can be dealt with by an incision beginning at its outer border and the middle lobe by one passing directly backwards horizontally. The relative size of the lobes, the amount of vascularity of the parenchyma and the presence of consolidation or oedema are then carefully noted, and the blood-vessels and bronchi slit up.

The Pharynx, Larynx and Structures in the Neck should be removed together. The knife is entered below the mental symphysis and the floor of the mouth divided. The tongue is then depressed with the finger and the soft palate divided at its junction with the hard. The knife should then be made to cut back on to the cervical vertebræ and the posterior pharyngeal muscles divided from above downwards. The soft palate having been examined, the pharynx is laid open from behind and condition of the glottis noted. The larynx and trachea can then be opened by a posterior incision.

In examining the abdomen the rule of removing first those organs the ablation of which will give rise to least disturbance of the relations of the remainder should invariably be followed.

The Spleen is first drawn forwards and removed by cutting the gastrosplenic omentum. The best section of the organ is obtained by a cut carried midway between its hilum and its convex external surface.

The Supra-renal Capsules and Kidneys should next be taken out; the for-

mer may be examined by several transverse cuts across the shorter diameter, while the kidneys should be divided into two equal halves by a vertical incision from the external border to the hilum, opening the infundibulum of the ureter.

The Ureters may now be followed to the bladder and slit up.

It is most convenient to remove the **Pelvic Organs en masse**. For this purpose the sigmoid flexure is first ligatured in two places and then divided; the rectum is then drawn forwards, and the peritoneum overlying the brim of the true pelvis is separated all round. The knife should now be directed to the hollow of the sacrum and the posterior attachments of the pelvic viscera separated; it is then brought round on each side of the pelvis to the front, and the urethra being pulled well backward beneath the pubic arch, is divided as far anteriorly as possible. In laying open the **Urethra and Bladder** the upper wall should be divided with scissors, while the **Rectum** is best opened from behind. The **Uterus** may be divided by a vertical lateral section which completely exposes its cavity. The **Testes** are now brought upwards to the external ring and then freed with the knife. They are best opened from behind so that the section completely traverses the epididymis and body of the organ. Two ligatures being now placed on the first part of the jejunum, the **Intestines** are removed and opened along their mesenteric attachment. The **Stomach and Duodenum** may well be examined *in situ*, the former being opened by an incision carried along its anterior surface midway between its greater and lesser curvatures, while for the duodenum the scissors should be carried along the inner attached border. The **Gall-duct and Portal Vein** are then slit up as far as their entrance into the liver. The stomach must be drawn upwards and the **Pancreas** opened by a cut horizontally across the organ from its head to its tail, its duct being laid open with scissors.

The Liver may be examined by a series of vertical antero-posterior incisions carried nearly to the posterior border; the condition of its vessels and ducts on section being especially noticed.

Attention should next be paid to the lymphatic glands occupying the mesentery and the retro-peritoneal space. After the organs have been removed, the

great vessels and receptaculum chyli are laid open with scissors in their whole length. Finally, any lesion of the parietes is to be followed up, and any required dissection of the joints or bones of the extremities made.

LEOPOLD HUDSON.

PREGNANCY, DISEASES OF.

—The occurrence during pregnancy of the following affections is here described:—

1. Salivation.
2. Heartburn.
3. Excessive or Pernicious Vomiting.
4. Varicose Veins.
5. Hæmorrhoids.
6. Leucorrhœa.
7. Pruritus.
8. Anæmia.
9. Progressive Pernicious Anæmia.
10. Leukæmia.
11. Renal Disease.
12. Dilatation of the Ureters.
13. Heart Disease.
14. Phthisis.
15. Retroversion of the Gravid Uterus.
16. Ovarian Tumour.
17. Cancer of the Cervix Uteri.
18. Hydramnios.
19. Relaxation of the Pelvic Joints.

1. Salivation is an occasional phenomenon of pregnancy. It may be so excessive as to lead to the discharge of from 3 to 4 quarts of fluid daily. The salivation of pregnancy is distinguished from mercurial salivation by the absence of sponginess or soreness of the gums. It may be only transitory, or may last throughout gestation. It is apt to recur in successive pregnancies. The only drug that has any effect upon the action of the salivary glands is atropine, gr. $\frac{1}{16}$, which may be injected into the neighbourhood of the gland. This drug has a special effect, exerted through the chorda tympani nerve, in checking the secretion.

2. Heartburn is a frequent and troublesome symptom, especially in the latter months. A familiar popular remedy, and a very good one, is half a teaspoonful of sal volatile with as much carbonate of soda as will go on a sixpence, in water. Tablets made of carbonate of soda with peppermint are also much used. Liq. mag. carb. ʒij to ʒij is disagreeable, but sometimes useful.

3. Excessive or Pernicious Vomiting.

ing.—The vomiting of pregnancy deserves the title of “pernicious” when it reaches the point that the patient is unable to retain *any* food, and therefore if it be not checked her life will be in danger. The practitioner must form his own judgment as to this, for it is not uncommon to be told that the patient keeps nothing down, when at the same time her condition shows that she is not suffering from defective nutrition. These cases of excessive vomiting during pregnancy fall into three groups—(1) Excessive vomiting of pregnancy, *i.e.*, cases in which the ordinary vomiting of the first months of pregnancy is more severe than usual, and more persistent, not ceasing at about the middle of gestation, but steadily getting worse; there being no cause for the vomiting, save the pregnancy. The vomiting is a reflex neurosis: and is most apt to occur in weakly women of nervous temperament.

(2) Vomiting in pregnancy. By this name are denoted cases in which pregnancy co-exists with some other condition and itself tending to produce vomiting, which it increases and renders intractable. Thus cases of pregnancy with disease of the stomach or bowels, and with whooping-cough and sea-sickness have proved fatal: the combined effect of the vomiting and the disease exhausting the patient.

(3) Certain rare and at present imperfectly understood cases, in which the vomiting seems to depend upon acute degeneration of glands; or a degenerative change in the liver allied to, or perhaps an early stage of, acute yellow atrophy; or a degenerative change in the kidneys allied to, and possibly an early stage of, that found in certain cases of puerperal eclampsia.

Fatal vomiting of pregnancy, of any kind is rare. When it occurs the patient dies from starvation. With the continual vomiting, and the non-retention of food, there is marked wasting, irritability, restlessness, and want of sleep. At last an apathetic condition supervenes, with a dry brown tongue, small and frequent pulse, and epigastric tenderness. There is a steady diminution in the quantity of urine, which contains more or less albumen. On the first appearance of symptoms of this kind, abortion should be induced; this prevents the patient from falling into the grave condition above described.

Treatment.—As a preliminary, the bowels should be cleared out, and the condition of the abdominal and pelvic

organs, not omitting the kidneys, investigated. (1) If there be no sign of disease, and the vomiting be not severe, medicinal treatment may be enough. There is no drug which is a specific for all cases: but there are many which in individual cases will be found to check the vomiting. Among these are—effervescing draughts: bismuth carbonate or nitrate gr. x; oxalate of cerium gr. x; carbolic acid gr. j; vin. ipecac. ℥j; or atropine gr. $\frac{1}{100}$. When there is anæmia, and discomfort after food, iron, and the preparations of pepsin do good. If there be epigastric pain and tenderness, a mustard poultice to this region may be useful. The bromides are indicated in conditions of great nervous irritability. If there be flatulence and a furred tongue, a mercurial purge will be beneficial. Regulation of diet is not of much importance in these cases, for appetite is very capricious, and articles of diet usually difficult of digestion may, if they excite appetite, be better assimilated than simpler food. The patient's inclination is therefore in this respect the best guide.

If treatment by drugs fail, the next remedy to be tried is *recumbency*. In most cases the vomiting ceases while the patient is lying down, and in bad cases it may be necessary to compel her to remain in bed. If, notwithstanding this, the patient still vomits whenever she takes food, the next resource is to *keep the stomach at rest*, by giving nothing by the mouth, supporting the patient by nutrient enemata. If this measure fail in improving the patient's condition, the *cervix may be dilated*. This is an empirical remedy, which often succeeds, but often induces abortion. If it fail, then *induction of abortion* is the last resource: and it should not be postponed until the patient's condition is hopeless.

Cases of vomiting in pregnancy are recognised by the presence of signs and symptoms of the disease which, combined with the pregnancy, is causing the vomiting: and the treatment will be dictated by the nature of that disease.

In any case in which there is reason to fear that acute atrophy of the liver, or one of the allied glandular degenerations which have been mentioned, is commencing, when, for example, besides excessive vomiting, there is headache, irritability, restlessness, great prostration, diminution of liver dulness, or albumen in the urine, abortion or premature labour

should be induced without delay, for it offers the only hope for the patient, and there is but little likelihood of a favourable result unless the operation be performed at an early period.

4. **Varicose Veins** of the lower extremities and of the pelvis are often met with in pregnancy, especially in multiparæ. The usual results of the varicose condition are present: dilatation, tortuosity, thinning at some parts, thickening at others. They usually begin to be troublesome about the fifth or sixth month, causing aching and slight swelling of the lower limbs; when there is already varicosity, it often perceptibly increases from the very beginning of pregnancy. Some patients describe similar symptoms without there being any conspicuous varicosity of the superficial veins to account for them. In such, varicosity of the deep veins has been assigned as a cause for the aching in the limbs. The veins commonly diminish in size after delivery. Varicosities of the superficial veins may lead to *ulceration* and to *rupture*. The favourite seat of rupture in the leg is just above the inner malleolus. The hæmorrhage from this accident is often great, and may be fatal. It is to be stopped by elevation of the limb, and pressure on the bleeding spot. The varicose condition may also lead to *thrombosis* and *phlebitis*. Simple thrombosis is not common in pregnancy. Phlebitis often is more common, ending in suppuration. The attack ends in the bursting of the abscess, subsidence of the inflammation, and obliteration of the vein. It may lead to embolism or pyæmia, but these results are not frequent. A vein may burst subcutaneously, and form a swelling called a *hematoma* (*q.v.*).

During pregnancy no radical treatment for the cure of varicose veins should be carried out. Support may be given to the limb by a bandage, strapping, or an elastic stocking. Phlebitis should be treated by rest, elevation of the limb, and evaporating lotions, and the patient must be warned against friction, lest a clot be detached.

Varicose veins of the vulva or vagina sometimes form tumours so large as to attract the patient's attention, and cause much annoyance by producing intolerable itching, impelling the patient to scratch or rub the part. Either from such scratching, or from some slight local violence, they may burst—a very dangerous accident, for in most cases of the kind the patient has died before medical

help could reach her. Bursting during labour is less serious, because, then, help is usually at hand. In these cases, to prevent accidents and to relieve symptoms, the recumbent position should be maintained.

5. **Hæmorrhoids** are apt to arise during pregnancy, and it is still more common for small piles, which have not attracted notice before, to cause a good deal of trouble then. Their cure by operation is better not undertaken during pregnancy. For the relief of the symptoms they cause, the essential points are the avoidance of constipation, and the recumbent posture when discomfort is present. The rectum should be washed out with an enema of cold water every morning, and if the piles come down during defæcation they should be pushed back and the patient should remain recumbent until all discomfort has passed off.

6. **Leucorrhœa.**—Some amount of leucorrhœa is frequent during pregnancy, the increased vascularity of the parts leading to increased secretion.

7. **Pruritus** is a not uncommon trouble. It is best treated by frequently washing away all irritating secretions, and by the application of a sedative. These two purposes are accomplished by the use as a vaginal douche of a solution of borax (5j ad Oj).

8. **Anæmia in Pregnancy.**—The composition of the blood is altered during pregnancy. It contains more water, more fibrin, fewer red corpuscles but more white corpuscles, less albumen, and less hæmoglobin. It is increased in quantity. The condition has been described by the term "serous plethora." It departs from the standard of health in the direction of anæmia. Some amount of anæmia during pregnancy may, therefore, be regarded as an exaggeration of a physiological change. It should be treated exactly in the same manner as anæmia occurring in a person not pregnant. There is an old belief—it is difficult to say on what founded—that there is danger of bringing on abortion by giving iron during pregnancy. Iron may be given freely in pregnancy, and in an anæmic patient tends to prevent abortion rather than to favour it.

9. **Progressive Pernicious Anæmia** sometimes comes on in the second half of pregnancy. If it be allowed to run its course, it produces, first, death of the child, and then premature delivery; and this is soon followed by the death of the mother. When this disease is well

established, all treatment—iron, food, transfusion—quite fails to check it. The rapid progress of the disease as pregnancy advances, and the known tendency to anæmia therein, warrant the conclusion that in these cases the pregnancy is an important ætiological factor, and the induction of abortion the most hopeful treatment. In any such case, therefore, when, in spite of treatment no improvement results, abortion should be induced without delay.

10. **Leukæmia.**—This disease has been observed along with pregnancy, but the two conditions do not appear to have any effect on one another, except that the co-existence of the enlarged spleen and the pregnant uterus causes more than usual abdominal enlargement and consequent discomfort.

11. **Renal Disease in Pregnancy.**—

In a small number of cases of normal pregnancy, some albumen is present in the urine, due either to slight cystitis or to venous congestion of the kidneys, produced by pressure. But comparing the frequency of renal disease in pregnancy with its frequency in females at the same ages who are not pregnant, it is clear that pregnancy brings with it a special liability to nephritis. Between 0.5 and 1 per cent. of pregnant women suffer in this way. It is a dangerous complication, both for mother and child, for it may lead (1) to puerperal eclampsia, a complication which occurs in about 20 per cent. of cases of renal disease; and (2) to renal disease which persists after the pregnancy and soon proves fatal. It is probable that one in five of such cases die within two years. In pregnancy with nephritis the child often dies *in utero*; and if eclampsia supervene, and the child have survived till then, it is likely to die from asphyxia, produced by the convulsions.

Pregnancy may take place in patients already suffering from renal disease, no matter of what kind. In that case the course of the disease is likely to be accelerated by the pregnancy, and there is danger of eclampsia.

Of renal disease coming on during pregnancy, three forms may be distinguished—(1) *Acute Nephritis*.—This is rare during pregnancy, as it is rare without it. It is mostly followed by delivery, and accompanied it by eclampsia; but may occur without eclampsia. The mortality is high, but if the disease does not prove fatal, recovery takes place quickly and completely. The symptoms and treatment are the same as those of

acute nephritis in patients who are not pregnant (*see* BRIGHT'S DISEASE, ACUTE).

2. *Subacute Chronic Nephritis* is commoner. The disease comes on gradually, without any evident cause. It usually begins about the fifth month. Anasarca appears, and is often great, the lower extremities being usually the first affected; there may also be effusion into the serous cavities. Bronchitis, and œdema of lungs, disturbances of sight, and retinitis are symptoms commonly observed. The quantity of urine is diminished, and it contains abundant albumen and casts. Labour comes on prematurely in the majority of cases. Eclampsia is present in about 25 per cent. Often the nephritis terminates after delivery, and the patient gets well. But it may go on to the production of chronic and ultimately fatal kidney disease; and it may recur in subsequent pregnancies.

The *treatment*, speaking generally, is the same as that of nephritis apart from pregnancy. It is mainly dietetic. If the case be seen early, and treatment diligently carried out, the disease may be held in check, and the pregnancy go to term. But if the disease be pronounced, the only effective treatment is to induce labour. If this step be opposed on the ground of the danger to the child's life, it may be pointed out that death of the child *in utero*, and its spontaneous premature delivery, frequently occur; whereas, if the renal disease can be arrested, a future pregnancy which may go on to term is rendered possible, thus giving a better chance of a healthy child.

(3) There are cases of *eclampsia*, with scanty urine, loaded with albumen, in which the symptoms come on quite suddenly, without the slightest warning, in the midst of apparent health; and on post-mortem examination no macroscopic changes are found in the kidneys. It has been suggested that the disease in these cases is an acute atrophy of the kidneys analogous to the acute atrophy of the liver to which pregnancy predisposes; and a few cases have been described in which the results of microscopical examination supported this view. But the cases are so few in number that it cannot yet be said to be established.

12. *Dilatation of the Ureters*, from the pressure of the gravid uterus, has been shown to occur in a minority of pregnant women, and puerperal eclampsia has been ascribed to this condition. But

the amount of dilatation found is slight, and such as, apart from pregnancy, is not known to produce any similar effects.

13. Heart Disease and Pregnancy.

—There is no doubt that a large number of patients with valvular disease of the heart go through pregnancy and labour without suffering more than others whose hearts are sound. But in some cases—it is difficult to say in what proportion—the increased strain thrown upon the heart leads to its gradual failure during the latter half of pregnancy. This failure is manifested by the usual symptoms, œdema of the lower extremities, dyspnoea, cough, and hæmoptysis. The quantity of blood which the heart has to propel is increased, and there is a difficulty in the return of blood from the lower limbs caused by the augmented pressure within the abdomen. To these two causes the hypertrophy of the heart, which is by some believed to take place during pregnancy, is attributed. There is further danger from the straining which accompanies the second stage of labour when the heart is unsound; and also lest the sudden alteration of the conditions under which the circulation is carried on which follows delivery, should lead to cardiac failure, although the exact mode in which these altered conditions act is not known.

Bearing in mind these facts, it is our duty, if consulted prior to the marriage of a patient with cardiac disease, to warn her that pregnancy and labour will, in her case, be attended with more risk than usual. Should pregnancy take place, and slight symptoms of cardiac failure appear, they should be treated with digitalis and rest, in the same way as similar symptoms apart from the pregnant condition. Should such treatment not relieve, and the symptoms, as pregnancy advances, increase in severity, then labour should be induced without waiting for the patient's condition to become perilous. Rapid improvement in these cases follows the induction of labour. During labour, to prevent injury to the heart from straining, chloroform should be given.

14. *Phthisis and Pregnancy*. — It was formerly believed that during pregnancy the progress of pulmonary phthisis was retarded or arrested. The tendency of recent observations is to show that it is not so, but that such influence as pregnancy has upon phthisis, and upon patients predisposed to it, is unfavour-

able. Phthisis in pregnancy does not appear to exert any unfavourable influence upon the development or health of the child, beyond that the child inherits the mother's predisposition to the disease.

15. Retroversion of the Gravid Uterus.—This is one of the most important diseases of pregnancy. The body of the uterus is incarcerated in the hollow of the sacrum, being prevented from rising by the projection of the overhanging sacral promontory. The cervix uteri is raised, and presses the urethra upwards and forwards, so compressing it as to cause retention of urine. The causes of this displacement are (1) pregnancy taking place in a uterus already retroverted or prolapsed. This is probably the most common cause. For this reason the displacement is more common in multiparæ. (2) A sudden and violent effort when the bladder is full. The bladder, when full, carries the uterus upwards and backwards. If at this time the patient makes a great effort, the force of the intra-abdominal pressure, transmitted through the bladder, falls on the anterior surface of the uterus, and may drive it down below the sacral promontory. (3) Contraction of the pelvis, of the flat or rickety kind, in which the sacral promontory unduly overhangs, so that the uterus, if it once gets below it, finds an unusual difficulty in rising again.

Two aphorisms may be laid down, which epitomize the important facts in the clinical history of this condition:—*(a) Incarceration is everything: displacement nothing.* The mere retroversion of the uterus causes little or no trouble; it is only when incarcerated that symptoms arise. *(b) The bladder is everything: the uterus nothing.* All the trouble and danger of this disease come from the pressure on the bladder. It is important solely as a cause of retention of urine.

When the retroverted and incarcerated uterus comes to press on the urethra, it leads to distension of the bladder, and thus to pain and abdominal swelling. The retention then sets up cystitis. When the bladder has become greatly distended, the pressure in it becomes so great that it imperfectly overcomes the obstruction, and the urine dribbles away. This has been called "ischuria paradoxa." It thus often happens that the patient complains, not that she cannot pass water, but that she cannot retain it. It should never be forgotten that *incontinence of urine may be a symptom of retention.*

From the cystitis the urine becomes mixed with pus and blood. The cystitis may reach such a degree that sloughing of the vesical mucous membrane may take place; or the membrane may be extensively separated, dissected off, as it were, from the muscular coat, so that the whole of it lies in the bladder like a loose bag, or a large piece of it may lie loose in the bladder. This is called *exfoliative cystitis*. Or the sloughing may take place at one point, and extend through first the mucous, then the muscular coat, and then the peritoneum may give way, and so rupture of the bladder and extravasation of urine into the peritoneum may take place. More commonly the inflammation extends from the bladder along the ureter up to the kidneys, and pyelitis results. This may prove fatal long after the retention has been relieved. When either from cystitis or pyelitis, the patient becomes very prostrate, abortion is likely to ensue; but except in these circumstances, retroversion of the gravid uterus does not, as a rule, cause abortion. Cases have been described in which ulceration has occurred, and the uterine contents have been discharged by perforation of the uterine body through the vagina; but these were probably instances of mistaken diagnosis, being really cases of extra-uterine gestation. No case of this occurrence has been so well described as to remove all doubt about its nature.

The *clinical history* is usually this:—A patient who thinks herself in the fourth month of pregnancy, gives a history of retention of urine, accompanied by increasing abdominal pain and swelling, followed, after a few days, by incontinence of urine. There is often also obstruction to the bowel, but the symptoms from this cause are so much less urgent than those of the bladder, that they sink into the background. On examination the abdomen is distended and fluctuating. Per vaginam, a large rounded elastic tumour is felt, filling the hollow of the sacrum, and pushing the vagina forwards, leaving, it may be, only room for one or two fingers to pass between the tumour and the symphysis pubis. The cervix uteri is high up, above and behind the pubes; it may be so high as to be out of reach of the finger. The meatus urinarius is dragged backwards, and flattened by the tension on it, so that it may be very difficult or even impossible to pass a catheter without the aid of sight. The first step, in the examination of any fluctuating abdominal swelling, should

be to pass a catheter, and empty the bladder. When this has been done, bimanual examination will show that the body of the uterus is not in the abdomen. This will distinguish the case from one of extra-uterine gestation, pelvic hæmatocele, pelvic abscess, or ovarian tumour, for, in these conditions, if the cervix be high up close behind the symphysis, the body will be felt immediately underneath the anterior abdominal wall. The diagnosis between a retroverted gravid uterus and a retroverted uterus containing a fibroid will be made from the presence or absence of the signs and symptoms of pregnancy.

Treatment.—In nine cases out of ten it is enough to keep the patient in bed, and pass the catheter every six hours. If this be done, the uterus will generally ascend into its normal position within forty-eight hours. Should it not, it must be replaced, or circumstances may indicate immediate reposition as the best course. This can be usually done by pressing the uterus upwards by two fingers in the vagina, the patient being in the left lateral position. Should efforts thus made fail, the patient may be put in the knee-elbow position, and an attempt thus made. If that be unsuccessful, the patient must be anaesthetised, and upward pressure made by two fingers in the rectum. In this way, if the uterus be not adherent, it can be replaced. It is seldom that a pregnant uterus is adherent; for adhesions, firm enough to prevent the uterus from rising into the abdomen, usually produce early abortion. In whatever way applied, the pressure should be made not directly upwards, but towards one side, so as to avoid the projection of the sacral promontory. Should the uterus be so adherent that reduction is impossible, abortion should be induced, by passing a curved sound into the uterus. If this cannot be done, the size of the uterus may be reduced by puncturing it through the vagina, and drawing off the liquor amnii. Cases are infinitely rare in which this can be required.

After the retention has been relieved and the uterus righted, a copious diuresis usually takes place, but after a day or two the secretion of urine gradually sinks to the normal quantity. The cystitis must be treated by the usual methods. Exfoliative cystitis may be inferred if the cystitis does not yield to treatment, and if the catheter seems to impinge on something resistant in the bladder, and when this takes place the

flow of urine sometimes stops. In that case the bladder should be opened by an incision from the vagina in the middle line, the exfoliated mucous membrane removed, and the opening left patent for a few weeks.

In rare cases, recovery may take place without reposition of the uterus, the organ continuing to enlarge by expansion of its anterior wall upwards into the abdomen; so that, at the full term of pregnancy the cervix uteri is above the symphysis, and the cavity is partly above it, in the abdomen, partly below it, in the hollow of the sacrum. In these rare cases, the cervix descends during labour, and comes to occupy its normal position.

16. Ovarian Tumour.—This involves much additional risk. The distension of the abdomen is greater. The tumour, if small, may obstruct delivery. There is special liability during pregnancy to twisting of the pedicle of ovarian tumours, and they are also liable to become inflamed or ruptured, from the pressure exerted. Therefore if an ovarian tumour be discovered in a pregnant woman, or even during labour, the proper course is to remove it without delay.

17. Cancer of the Cervix.—When pregnancy is thus complicated the progress of the cancer is accelerated. The best means of prolonging the patient's life, as well as saving her from the dangers of labour obstructed by the cancer, is to induce abortion as early as possible. This may be done the more readily, because cancer often leads, when allowed to go to term, to the death of the child *in utero*. But if the cancer can be removed, this should be done.

18. Hydramnios means excess of liquor amnii. Its chief interest is obstetrical. But it requires notice here because it may be difficult to distinguish from (1) ascites or (2) ovarian dropsy. (1) In ascites there is resonance in front, dulness in the flanks, the line between resonance and dulness changing with the position of the patient. In hydramnios, there is resonance in the flanks, dulness in front, and no alteration from position. In hydramnios there are the signs of pregnancy and ballottement is very distinct. In ovarian dropsy without pregnancy, there will not be softening of the cervix or other signs of pregnancy, and the uterus, by careful combination of rectal, vaginal and bimanual examination, can be made out apart from the tumour. In ovarian dropsy with pregnancy there will be a sulcus between the pregnant uterus and

the tumour. No such sulcus is felt in hydramnios, even if there be twins. In some cases, especially when ascites complicates the other conditions named, diagnosis may be very difficult, and an exploratory incision the best course.

19. Relaxation of the Pelvic Joints is normal in pregnancy, but it may go on to such an extent as to prevent the patient from walking. The joints, of which the softening is important, are the sacro-iliac and the pubic. The condition is detected by putting the patient on her back, putting the thumb and finger respectively above and below the symphysis pubis, and bidding the patient draw up first one leg, then the other. When this is done, any movement at the symphysis will be perceived. The sacro-iliac joints may be examined by putting the hands on the bones forming them, and in a similar way testing their mobility; also by testing whether the iliac crests can be at all moved to and from the middle line. The treatment is to apply a strong bandage, of unyielding material, round the hips, embracing the trochanters and the iliac bones.

G. E. HERMAN.

PREGNANCY, SIGNS, SYMPTOMS, AND DIAGNOSIS OF.—

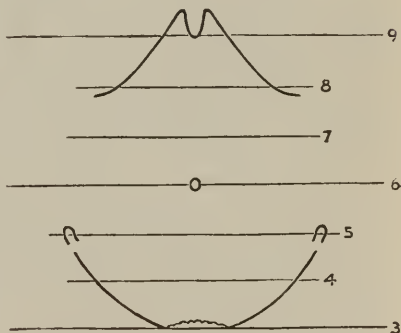
The signs and symptoms of pregnancy may be thus classified:—(a) Signs useful to the mother; (b) Signs valuable when combined; (c) The certain signs; (d) Phenomena of no diagnostic value.

Signs Useful to the Mother.—(1) *Amenorrhœa*.—The especial value of this is, that it is the *first* symptom; and it is therefore by its aid that we estimate the date of delivery. It has no diagnostic value, for hæmorrhages may take place throughout pregnancy, amenorrhœa may occur from other causes than pregnancy, and pregnancy may occur in a patient who is not menstruating regularly. But it is the symptom which usually announces to the patient that she is pregnant.

(2) *Morning Sickness*.—This is the symptom by which women usually judge whether their not having menstruated is due to pregnancy or not. It usually begins as nausea about the fourth or fifth week, reaches its height about the tenth or eleventh week, and ceases at about the middle of pregnancy. It is not invariably present, and, as vomiting may occur from many causes, it will be clear that it has no diagnostic value, but it helps the patient to form her own opinion.

Signs Valuable when Combined.

—(1) *Enlargement of the Uterus*.—This enlargement is practically confined to the body of the uterus, the enlargement of the cervix being very slight. As the body of the uterus enlarges, the shape of the uterus, taking the body and cervix together, becomes more and more that of a pear; but in the second half of pregnancy, the enlargement of the body is so much greater that the cervix may be left out of account, and the uterus described as egg-shaped. The size of the uterus at different periods of pregnancy can be easily remembered, if gestation be divided into periods of three months each. At the end of the first three months the uterus reaches to the pelvic brim, at the end of the second three months to the umbilicus, at the end of the final three months to the ensiform cartilage. If then, each of the spaces intermediate between these points be divided into three, the divisions will mark the height of the uterus at the fourth, fifth, seventh, and eighth months of pregnancy respectively (see diagram).



The lines indicate the upper level of the pregnant uterus at the various months.

(2) *Intermittent Contractions of the Uterus*.—Throughout pregnancy the uterus alternately contracts and relaxes, at intervals varying from five to twenty minutes. During contraction it slowly hardens, becoming soft again when relaxation follows. The recurrence of these changes is characteristic of uterine enlargements. It does not take place in any other kind of abdominal tumour. It is not peculiar to pregnancy, for it may occur in the uterus when enlarged by fibroids. It is useful in the diagnosis of pregnancy, for it assures

us that the tumour which we feel is the uterus.

(3) *The Uterine Souffle*.—This is a blowing sound, synchronous with the maternal pulse. It is usually heard best low down and at the sides; but it is heard at various places in different patients, and at various times in the same patient. While the uterus is contracting it gets louder, diminishing when the contraction reaches its height, increasing again as the contraction is passing off, and becoming a soft sound again when relaxation is complete. It is not affected by the position of the patient. A murmur of the same kind, and varying rhythmically in the same manner, is often heard over uterine fibroids. A blowing murmur, very much like this, may sometimes be produced by the pressure of the stethoscope over other abdominal tumours. This does not vary rhythmically, but is altered in intensity by increase or decrease of pressure, and by the position of the patient. A blowing murmur, varying rhythmically tells us that the tumour is uterine, but nothing further.

(4) *Mammary Changes*.—As these to some extent persist after the first pregnancy, they are of no diagnostic value in any pregnancy except the first. They begin early in pregnancy and gradually become more marked up to the end. They consist in enlargement and vascularity of the glands, and pigmentary changes. The enlargement is due to increase of the gland tissue. From the increased vascularity the connective tissue becomes looser, the lobules can be more easily felt and moved upon one another, and the gland acquires a knotted feel. The large veins are plainly visible through the skin. The nipple is enlarged, its colour deepened, and the areola becomes wider and darker, extending from half an inch to 3 inches outwards from the nipple. The size and colour vary: in brunettes, it is very dark, almost black; in blondes, it is light. During the last three months of pregnancy in the outer part of the areola white spots appear in the dark ground; this is called the secondary areola. In the last few months the nipple becomes covered at the apex with branny scales. From about the fifth month onwards, a drop of opalescent fluid can be squeezed from the nipple; in the last month or two this can be expressed more abundantly, and the fluid contains cream-like globules. These changes, when well marked, in a woman who has never been pregnant, are almost conclusive. They are not ab-

solutely so, because it is possible for them to be produced without pregnancy, by giving suck. But in England it is so extremely rare for a virgin to suckle a child that these changes in the breasts form very strong evidence of pregnancy. They have especial practical utility, because the state of the breasts can be ascertained under pretext of auscultating the chest, without suggesting suspicions that might give offence.

(5) *The Colour of the Genital Mucous Membrane*.—In pregnancy the pelvic organs become very vascular, and, in addition, the increased pressure within the abdomen leads to distension of those veins which return their blood through the inferior cava, and frequently to a varicose condition of them. The result is, that the mucous membrane of the cervix uteri, vagina, and vulva, instead of being the same pink tint as the buccal mucous membrane, becomes a dark bluish purple. This change goes on progressively throughout pregnancy, and is very marked towards the end. Occurring in a young woman who presents no sign of serious ill-health this is an important sign of pregnancy. The bluish colour may also be produced by great venous obstruction owing to heart, lung, or liver disease. But change in colour as great as that in pregnancy is only produced by disease of such magnitude that it could scarcely be overlooked.

(6) *The Softening of the Cervix*.—The cervix becomes enlarged, its texture looser, and, owing to the great vascularity, it becomes softer. The vagina is altered in a similar way, but the change is more easily recognized in the cervix. The softening becomes more and more marked as pregnancy goes on. It is well described by the comparison, that the consistence of the unimpregnated cervix is that of the tip of the nose; the consistence of the cervix at the full term of pregnancy that of the lip. Like the bluish colour, the softening may be produced by great venous congestion, and what has been said of the value of that sign of pregnancy applies also to the softening of the cervix.

(7) *Ballottement*.—This sign consists of two sensations—(a) That of a solid body retreating from the fingers when they are suddenly pressed against the uterus; (b) That solid body again falling back on to the fingers. To obtain this sign it is necessary that the fingers should press where there is a resisting part of the child in contact with the uterine wall. There are two chief ways of obtaining the sign.

First, the patient being on her back, by palpation it is ascertained to which side the back of the child appears to be turned. The patient then lies on that side, and one hand is placed beneath the abdomen, the other above it, and with the lower hand the back of the child is sharply pushed up. If the conditions are favourable the child's body is felt to move upwards, and to strike against the upper hand. When it sinks down its impact is felt by the lower hand. Second, the patient being supported in a position midway between sitting and reclining, so that the axis of the uterus is vertical, pressure is made with two fingers per vaginam on what is thought to be the child's head, the other hand being placed on the fundus uteri, the sensation of the child's moving upward and then sinking down being felt as in the former method. This sign cannot be obtained until the fifth month, because not till then is the child big enough to give a perceptible shock, and as a rule it cannot be attained after the seventh month, because then the child is so large in proportion to the uterine cavity that it cannot move freely enough. The sign is not free from error, as an ovarian tumour, with a pedunculated growth inside it, or a movable tumour with ascites, may simulate it. But, taken with other signs, it is sometimes useful.

The signs that have been mentioned, viz., a tumour, shown to be uterine by its intermittent contractions and by the rhythmically varying *souffle* heard over it, and presenting *ballotement*, softening of the cervix, and a bluish colour of the genital mucous membrane, in a woman not seriously out of health, taken together, warrant the diagnosis of pregnancy in a case in which the certain signs cannot be perceived.

The Certain Signs.—In the second half of pregnancy, if the child be living, the sounds of the *fœtal heart* may be heard. The sound is double, and varies in frequency from 120 to 180 per minute. It is heard best over the back of the child's chest; and this, in the usual position of the child, is below and to the left of the umbilicus. It is quicker as a rule in female children than in male. If over 145, the probability is that the child is a female; if under 135, male. The action of the *fœtal heart* is slightly accelerated when a uterine contraction is coming on, it is retarded during the height of the contraction, and is again accelerated as it passes off, subsequently returning to its average frequency. The action is accelerated by febrile conditions of the

mother. This sound is absolute proof of pregnancy.

In the first half of pregnancy, we may attain practical certainty if, by examining the patient more than once at intervals of two or three weeks, we can ascertain the *regular increase* in size of the uterus, together with the gradual development of the other signs.

Phenomena of no Diagnostic Value.—Among these are, the appearance after the urine has stood of an iridescent pellicle on its surface, called *hiestein*. This occurs in other conditions and even in men. Its import is unknown. The development of *pigmentation* of other parts beside the mammary areola, as along the middle line of the abdomen, on the perineum, in the axillæ, on the face, &c. *Fœtal movements*, which are of no use for diagnosis, because if they are felt the *fœtal heart* ought to be heard. *Atrophic lines* on the skin of the abdomen and breasts, from stretching of the skin by enlargement of the parts it covers. These may be produced by any condition which stretches the skin. *Longings*, that is, cravings for particular articles of diet, generally either fruit or highly flavoured things, such as pickles, salted fish, or meat. There is an old superstition that it is necessary to gratify these longings; it is baseless, but there is no harm in gratifying them.

Twin Pregnancy may be diagnosed if over different parts of the uterus two *fœtal hearts*, not beating synchronously, can be heard. G. E. HERMAN.

PROGNOSIS.—The forecasting of what will probably be the result of a disease is amongst the most important of the duties of the physician. A prognosis, if it is to be worth anything, must be founded on an accurate diagnosis, which in its turn must depend not only upon a close investigation of the symptoms and signs of the disease but upon an accurate knowledge of its pathological relationships, as well as upon a careful analysis of the past history of the patient. The prognosis will often depend upon the results of treatment, and on the obedience of the patient to instructions.

PROGRESSIVE MUSCULAR ATROPHY (Wasting Palsy; Chronic Anterior Poliomyelitis).—A disease characterized by progressive wasting of individual muscles or physiological groups of muscles, and by an associated and proportional amount of paralysis.

The morbid change consists of degeneration and atrophy of the multipolar cells in the anterior grey matter of the spinal cord, with consecutive degeneration of the anterior nerve-roots and muscles.

Symptoms.—The disease commences slowly, and usually the earliest indication is wasting of the muscles of the hand with impairment of power, often first noticed in the act of writing or in the performance of some other delicate action. Occasionally, these symptoms are preceded by pain, of no great severity, in the muscles subsequently affected. Although the hand, usually the right, is most frequently the part first attacked, the disease sometimes begins in the shoulder muscles, the muscles of the back, the extensors of the forearms, and, very rarely, in the lower limbs. In the hand, the muscles of the ball of the thumb are the earliest to undergo atrophy, the interossei and the hypothenar eminence soon following. Of the thumb the opponens and adductor are the first affected. The hand soon takes on a peculiar claw-like form (*main en griffe*), and from the wasting of the abductor indicis the thumb assumes a position nearly parallel with the index finger. The muscles of the forearm are usually next attacked, and with them not uncommonly the supinators. The deltoid often now suffers, with the muscles of the upper arm and of the scapula, the triceps retaining its normal bulk longer than the rest. The second arm is usually attacked in the same manner as, and soon after, the first, often before the atrophy has spread beyond the muscles of the hand on the side first affected.

Of the muscles of the trunk the middle and lower parts of the trapezius are first invaded, the upper part of this muscle remaining normal. The pectoralis major, the serratus magnus, the latissimus dorsi, the rhomboidei, the extensors of the head, the other muscles of the back, the sterno-mastoid, and, more rarely, the levator anguli scapulæ become involved. The sternal and clavicular parts of either the pectoralis major or of the sterno-mastoid may be affected separately. The platysma myoides is said always to escape. The intercostals and the diaphragm sometimes suffer, and occasionally the muscles of the abdominal wall; under such circumstances danger to life from interference with respiration may arise.

The lower limbs are usually affected

late in the course of the disease. The muscles first attacked are the tibialis anticus group, the glutei and the extensors of the knee. Dr. Gowers asserts that the lower limbs not unfrequently become paralysed with little or no wasting, the loss of power which is gradual, being accompanied by increased knee-jerks and clonus.

Towards the end the facial muscles may become involved, and symptoms of glosso-labio-laryngeal palsy may supervene.

In children attacked by progressive muscular atrophy, the muscles of the face are the earliest affected, and hence ensues an expressionless and almost idiotic aspect. It is believed by many observers, however, that this "juvenile" form of muscular atrophy is really a variety of "simple idiopathic muscular atrophy."

In the advanced stage, the wasting becomes extreme, so that bony prominences normally concealed become obvious. At this period the fatty tissue may disappear, though earlier in the disease it may be abundant, and on this account the muscular wasting may be not apparent.

The loss of power in the affected muscles progresses gradually and is proportional in amount to the wasting. Hence complete paralysis does not take place until the atrophy has become extreme. The muscles respond with undue readiness to mechanical stimulation, and fibrillar movements of the muscles may very frequently be seen and felt. Such movements, however, are not peculiar to progressive muscular atrophy, although undoubtedly more common in this affection than in any other.

The galvanic and faradic irritability of the muscles diminishes as the muscular atrophy progresses, and when the latter becomes extreme, no reaction can be obtained with either form of stimulation, even with the strongest currents.

The galvanic irritability may, however, persist after the faradic has disappeared. The nerve-trunks remain excitable for a longer time than the muscles.

Vaso-motor disorders are often present in the limbs, the affected parts becoming cold, livid or pale. In the early stages the temperature of the parts involved is said to be slightly elevated, later on a distinct lowering of the temperature occurs. Trophic changes in the skin are sometimes present, but they are rarely extreme. In exceptional cases

articular swellings chiefly of the phalangeal joints have been noted. Changes in the pupil have been rarely described, but they are especially likely to occur when the muscles supplied from the lower cervical region are implicated. The reflex actions of the atrophied limbs become enfeebled and finally disappear. Cutaneous sensibility is not affected, though subjective sensations of numbness, coldness and the like may be present. The functions of the sphincters remain unimpaired, and there is no tendency to the formation of bed-sores. Sexual power is not uncommonly lost. Lordosis, and various deformities, of which club-foot is the most common, are occasionally seen in progressive muscular atrophy.

Diagnosis.—It is important to bear in mind that the muscular wasting, unlike that occurring in many spinal affections, is not diffuse. The muscles, as has already been pointed out, are affected according to their physiological grouping. Chronic meningitis or any condition giving rise to pressure on the nerve-roots may be followed by muscular atrophy; but in such cases the posterior roots are usually involved, and hence severe premonitory pains are common, and anaesthesia subsequently appears. In amyotrophic lateral sclerosis the wasting is widespread, and is preceded and accompanied by rigidity, with exaggerated reflexes. The diagnosis between progressive muscular atrophy, multiple neuritis and pseudo-hypertrophic paralysis presents little difficulty. In lead palsy the onset is comparatively abrupt, the electrical reactions are profoundly changed, and the paralysis precedes the atrophy.

Prognosis.—The disease, although usually progressive, is essentially chronic. Occasionally the affection becomes stationary, and this may occur at any stage. Arrest is said to be more common in cases arising from over-use of the affected muscles. The outlook is very serious when the respiratory muscles are attacked, and when symptoms of bulbar paralysis make their appearance.

Morbid Anatomy.—It is now admitted that the most constant morbid change is degeneration with atrophy of certain of the multipolar cells in the anterior grey matter. The lesion is almost always more marked in the cervical region than elsewhere. Dr. Ross believes that the disease begins in the central grey column and extends outwards and forwards into the anterior cornua. The anterior nerve-roots become atrophied, and their fibres

degenerated and subsequently replaced by fibrous tissue. In some few recorded instances the destruction of the anterior grey column has apparently resulted from dilatation of the central canal (hydromyelia).

In many cases sclerosis of the direct and crossed pyramidal tracts in the cord, and sometimes of the entire system of these fibres as high as the cortex, has been described. Dr. Gowers is of opinion that the pyramidal tracts are invariably degenerated. The posterior horns and roots are always intact. In the early stage of the disease the vessels of the cord are enlarged and their walls thickened. Degeneration of the peripheral nerves, sometimes limited to the minute intra-muscular branches, sometimes affecting the large trunks, has been found by several observers. The affected muscles are wasted, pale or buff-coloured. The fibres are narrowed granular or fatty, and the striation indistinct or absent. Scattered among these degenerated fibres there are often many which present little or no deviation from the normal. Some interstitial change, with accumulation of fat, is not uncommon. Lastly, it may be mentioned that changes have occasionally been found in the sympathetic ganglia and nerves, but it is now almost generally allowed that such alterations have no share in the causation of the disease.

Ætiology.—The disease is much more frequent in males than in females, and it is mainly an affection of adult life. A history of nervous affections in the progenitors is found in a large proportion of cases, but direct transmission of the disease itself is much less common. Excessive muscular exertion is believed by many to be a potent exciting cause. Exposure to wet and cold, mental emotion, injury to the spine or to a limb, are occasional antecedents. Syphilis probably plays an unimportant share. The disease occasionally follows one of the specific fevers.

Treatment.—Drugs are often of little service. When there is a possibility of a syphilitic taint, mercury and iodide of potassium should be tried for a few weeks. Gowers speaks favourably of arsenic and strychnine. He recommends that the latter be administered subcutaneously in the form of the nitrate of strychnine once daily, and that the dose be $\frac{1}{16}$ grain, gradually increased to $\frac{1}{4}$ grain. Electricity is occasionally of service, though in many cases it entirely fails. The galvanic current is usually more efficacious than the

faradic, but both may be used alternately.

The electrodes may be applied to the muscles themselves, or one pole may be placed on the spinal column in the region corresponding to the diseased part of the cord. Duchenne preferred the use of the induced current, and recommended that it be applied to the affected muscles. Passive movements and massage may also be employed. Hydro-therapeutic measures are of no service. Unfortunately, in a considerable proportion of cases all remedies fail. Amelioration, however, often occurs spontaneously, and arrest of the disease is by no means uncommon.

W. B. HADDEN.

PROPHYLAXIS signifies the means of preventing disease; thus the practice of disinfection is prophylactic against the spread of zymotic disease.

PRURIGO.—A chronic disease of the skin which begins in early childhood, presents an extensive eruption with special characters and distribution, is accompanied by intense itching, and secondary dermatitis due to scratching.

The affection is closely allied to chronic papular urticaria (*lichen urticatus*), and may be regarded as the head of the urticarial family, the various members of which present considerable differences of character and severity. It is slightly commoner in the male than in the female sex. It appears first in early infancy in the form of urticarial wheals of the ordinary type, of various size and shape; these develop in successive crops indiscriminately all over the body. Generally in the second year of life, small, hard wheals appear, which have a predilection for the trunk and outer sides of the limbs, and which become more and more numerous as time goes on. The large wheals, on the other hand, become less numerous till about the fifth year, when the condition termed "prurigo" is usually established, but exacerbations with crops of large wheals occur from time to time throughout life, especially in cold weather.

In a typical case of moderate severity (*P. mitis*) the lesions consist mainly of pale or pinkish papules, varying in size from a pin's head to a hemp-seed, never arranged in groups, situated deeply in the skin, and therefore often more perceptible to touch than to sight. Their seats of election are, in order of frequency and severity, the outer sides and backs

of the legs, the front and outer sides of the thighs, the buttocks, loins, thorax and abdomen, the extensor surfaces of the fore- and upper arms. A few papules are generally present on the face, especially on the cheeks and forehead. A still smaller number exist generally on the neck and scalp, although the hair is lustreless and dry. The regions conspicuously free from them are the soles and palms, the hams, but especially the popliteal spaces, axillæ, and the bends of the elbows. Where the papules are closely studded together the skin feels rough, and has been compared to a nutmeg-grater. As the result of the intolerable itching the tops of the more prominent papules are scratched off, and blood crusts form upon them. The "pruriginous habit" is thus established, and fresh lesions are constantly produced outside the originally affected areas. In consequence of constant scratching other secondary lesions are evoked, and, if severe, the case then corresponds to Hebra's description of *P. ferox*, the wholesale acceptance of which, as typical of the disease, gave rise to the false impression—only dispelled at the International Congress held in London in 1881—that the disease does not exist in this country. These secondary lesions comprise linear excoriations, severe dermatitis with chronic congestion, vesication, serous discharge, pustulation, scabbing and ecthymatous sores, deep pigmentation with infiltration, thickening, and exaggeration of the normal lines of the skin, loss of lanugo hairs and sympathetic enlargement of the lymphatic glands, especially of those in the inguinal regions, which may form large prominent tumours. In the ultimate stages the skin becomes leathery, dry and shrunken, both sweat and sebaceous functions being abolished. The course of the disease is never continuous, but the fresh exacerbations which constitute its progress are generally less frequent in summer than in winter—probably owing to the better regulation of the temperature of the skin produced by perspiration—the rule being, however, by no means an invariable one. The disease described, however, by some authors as summer prurigo (*P. æstivalis*) is a form of relapsing bullous eruption much more closely allied to the vesicating erythema than to that under discussion. As the result of want of sleep from itching the patients are always pulled down, miserable, pale and emaciated. In a few cases fatal marasmus is estab-

lished, but in the great majority death results from independent causes.

The *diagnosis* is only a matter of difficulty when the secondary lesions are sufficiently accentuated to mask the real nature of the disease, and even in the severest cases their distribution is eminently suggestive. The affections with which prurigo is most likely to be confounded are pediculosis, scabies and eczema, especially in xerodermatous subjects (Crocker). In establishing the differential diagnosis the history must be borne in mind and too much stress must not be laid on the discovery of the so-called typical sub-epidermic papules. These are often absent, being destroyed by scratching immediately after their formation.

The *prognosis* depends mainly on the stage of the disease when the case is first seen, and on the general surroundings of the patient. In old standing cases in adults it is unfavourable.

Pathology.—Nothing is known of the essential pathology of the affection. Its "nervous" origin is generally admitted, and some authors even maintain that the initial, as well as the secondary, lesions, are the result of scratching, thus making the disease a pure neurosis or sort of essential pruritus. The characteristic initial "sub-epidermic" papule is due to inflammatory infiltration into the substance of the corium, spreading to its upper papillary layer. Subsequently the epidermic layers hypertrophy, the rete cells multiply, are the seat of excessive pigmentation, and become enormously involutioned, causing exaggeration of papillation. The *musculi arrectores pilorum* hypertrophy, and contribute to the formation of the papules. The vessels of the corium dilate, and a fibrosis of that layer occurs, which may result in the destruction of the sweat and sebaceous glands.

Ætiology.—Prurigo seldom affects persons of the upper classes who are able to treat its earliest manifestations in infancy; it prevails among the poor, the badly nourished and the squalid, and probably in all countries, although commoner in temperate and cold climates. No recognized diathesis predisposes to its development or modifies its course.

Treatment, to ensure success, must be vigorous, assiduous and applied to the earlier manifestations of the disease. The patient must be placed in good hygienic surroundings; the diet must be simple and digestible, although generous. Crustacea, molluscs, dried and salted

fish, pork, tinned meats, strawberries, and other common excitants of nettlerash must be sedulously avoided. Digestive derangements must be treated on the ordinary lines. The regulation of the bowels is of special importance, and is generally best accomplished by a morning saline draught. Cod-liver oil is of great value as a reconstituent, and iron is often a useful adjunct. Arsenic is of undoubted value in some cases, the amount of itching being diminished during its administration, while in others it is inferior to carbolic acid (best given in pill form). Sulphate of atropine and pilocarpine have both their adherents, but as both are best administered subcutaneously, they are seldom applicable in the case of children. Salicin and the salicylates have also been recommended.

Prolonged warm bathing is of the greatest use; a bath of 30 gallons of water at 90° F. may be taken for twenty minutes night and morning, and the addition of sulphide of potassium (3ij) tends further to diminish irritability and lessen the frequency of urticarial outbreaks. After the bath the body must be carefully dried with soft towels. A weak lotion of liquor carbonis detergens (5j ad 5vii) may then be sponged on all over, but ointments are generally preferable. Of these probably the best is vaseline containing 2 per cent. of salicylic acid or from 2 to 5 per cent. of β -naphthol. In the aggravated cases in adults sulphur baths may be too irritating, when bran, mucilage or linseed baths may give relief.

J. J. PRINGLE.

PRURITUS signifies merely itching (*i.e.*, a functional disorder of sensation or paræsthesia), although the word is often erroneously used as synonymous with prurigo. It is a symptom of many diseases of the skin, especially of the urticarial group—including acute and chronic urticaria, lichen urticatus and prurigo—of pediculosis and scabies, and of eczema, especially in its papular and squamous phases. In other affections—*e.g.*, psoriasis and lichen ruber—although it is usually present and sometimes a very marked feature, its intensity varies within very wide limits. Too much stress is usually laid upon its absence as characteristic of dermatosyphilis, as squamous "specific" manifestations are not infrequently accompanied by considerable pruritus.

Itching may accompany jaundice from whatever cause proceeding, lithiasis, diabetes and albuminuria, probably as the result of irritation of the peripheral

nerves or of the sensory centres by the toxic substances circulating in the blood. In the same category may be placed the itching which in some cases follows the administration of morphine or quinine. When secondary to digestive derangements, intestinal worms, pregnancy, organic or functional uterine or ovarian disturbances—especially about the menopause—or to genito-urinary diseases, it is generally regarded as “reflex.” Pruritus may, however, exist independently of all ascertainable cause, especially in advanced life, when the skin becomes thin, pale, dry, wrinkled and often warty, and in persons suffering under depressing mental or moral emotions. Frequently it follows exposure to cold or exists only in winter (*P. hiemalis*) especially in dry climates.

The sensation of itching needs no description; it may be universal or local, and may vary in position from time to time. It presents all grades of severity and may attain the utmost degree of torment, driving the patient to the use of all imaginable sorts of rough instruments for the accomplishment of the irresistible scratching which alone alleviates it, or even to insanity and suicide. The secondary dermatitis resulting from scratching includes the production of linear excoriations, urticarial wheals, thickened, pigmented skin, papules crowned with blood-crusts, vesicles, pustules, &c., and may mask the real nature of the malady, but the history of the case and the distribution of the lesions as contrasted with those of the above-mentioned diseases which it may complicate, generally render the diagnosis easy. The regions most affected by the secondary lesions are those most readily accessible to the hands; thus the back is seldom their seat; the inner sides of the legs and thighs are more affected than the outer and posterior sides, and the clavicular regions more than the shoulders. Not infrequently, however, patients who complain even of severe itching exhibit no scratch marks. Others entertain an ineradicable delusion that they are the subjects of some parasitic affection; the fantastic description of their symptoms and of the nature of the parasites they imagine to have discovered soon give an unmistakable clue to the nature of such cases. The local forms of pruritus are more frequent than the universal, and merit a few words of special description.

Pruritus of the Nostrils is popularly associated with the presence of intestinal

worms in children, or may be the precursor of an asthmatic attack.

Pruritus of the Anus and Neighbouring Parts occurs in children as the result of the presence of oxyurides in the rectum, but is commoner in adults, especially in those whose occupations are sedentary. It is frequently associated with hæmorrhoids, enlarged prostate, fecal accumulation, proctitis, or anal fissure. Its intensity may be extreme, and the secondary lesions are often very severe.

Pruritus of the Genitals in either sex may be the result of diabetes or vesical calculus. In females leucorrhœa or varix of the labial veins is often present, and the condition may exist only during menstruation as the result of mistaken neglect of cleanly precautions (*see also PRURITUS VULVÆ*).

Pruritus of the Feet occurs chiefly between the toes. It appears to be the result of sweat detention or decomposition.

Treatment must always be directed towards the cause of the disease, a complete examination being made with regard to all the conditions enumerated as sometimes underlying it, the examination of the urine being of paramount importance. The bowels will require careful regulation, and errors of diet or digestive derangements must be rectified. The use of alcoholic stimulants and of tea or coffee are decidedly contra-indicated. Of the remedies recommended for the alleviation of itching it may be truly said that their name is legion—than which there can be no more eloquent expression of their general inefficacy or unreliability. Only those which appear to the writer to be of real service are here alluded to.

Internally, arsenic is occasionally useful but it is wise to administer it in small doses. The tincture of cannabis indica (m_x increased with caution to m_{xxx}) is perhaps of greater service, but disagreeable cerebral effects are sometimes observed from it. Jaborandi in the form of the infusion and its alkaloid, pilocarpin (gr. $\frac{1}{10}$ or less hypodermically), merit further trial. Bromide of potassium has yielded unsatisfactory results, but the tinctures of hop, hyoscyamus and belladonna, and the sulphate of quinine seem sometimes of decided value, and given at bedtime may secure a good night's rest. In menopausal cases ichthyol (m_v or more in capsule thrice daily) occasionally acts with remarkable success.

Prolonged warm baths are generally to be recommended; they should be

taken at bedtime, and the addition of sulphide of potassium (3ij) or of borax, bicarbonate of soda or potash (of either 3vj or more) to 30 gallons of water often increases their efficacy. After careful drying various lotions containing tar or its derivatives may be employed, such are: R Liq. carb. deterg. 5j, spir. vini rect. 3j, aq. dest. ad 3vj; R Acidi salicylici 5ij, spir. vini rect. 3iv, aq. dest. 3x; R Acidi carbolici gr. v-xv, aq. dest. 3j; R Thymol 3ij, liq. potassæ 3j, glycerini 5iij, aq. dest. 3vii; R Hydrarg. perchlor. gr. ¼-1, spir. rosmarini 5ij, aq. dest. ad 3j; &c. Oily applications and ointments are less often useful, but an ointment of naphthol, 2-5 per cent., in vaseline and lanoline is to be recommended. For the local forms of pruritus, scrupulous cleanliness must be observed. It is generally serviceable to apply warm water freely on a sponge or piece of flannel, afterwards drying the parts with care. Mercurial ointments are of special value, particularly the red oxide ointment of the B.P. diluted with an equal quantity of benzoated lard; and black or yellow wash is often useful. Painting the parts with compound tincture of benzoin or a solution of nitrate of silver in spirit of nitrous æther (gr. x ad 3j) is invaluable in cases depending upon varix, while suppositories of cocaine (gr. ½) are most effectual in some cases of pruritus ani. J. J. PRINGLE.

PRURITUS VULVÆ.—Itching of the vulva may arise from various causes. (1) The presence of an irritating discharge. Almost any discharge may, under certain undefined conditions, cause troublesome itching. Thus, pruritus is often present before and after menstruation, and during pregnancy and in cancer, gonorrhœa, endometritis, and leucorrhœa of any kind. (2) It may arise from wearing pessaries, the effect of which seems to depend on some idiosyncrasy, a metal pessary causing pruritus in one patient, an india-rubber one in another. (3) Vulvitis may act as a cause, especially in children. Also skin diseases, such as eczema of the vulva, which is more especially met with in gouty subjects; erythema of the vulva, a frequent accompaniment of diabetes; also herpes of the vulva, furunculus and warts. (4) Parasites, *e.g.*, the pediculus pubis, scabies, ascarides. The pediculus pubis only causes itching when recently acquired: patients in whom the insect is habitually resident cease to notice it. (5) Nervous pruritus,

as in degenerative cerebral or spinal changes.

Treatment consists in keeping the parts very clean; frequently washing away by a douche all irritating secretions, and then applying some sedative application. The douche may be a saturated solution of borax. Greasy or glycerin applications are best for after-use, as they do not evaporate. The following are useful: ung. calomel., ung. zinci, ung. plumbi acet., glyc. boracis, and boric acid 3j, ad vaseline 3j. For class (2) the treatment is that proper for the underlying disease. The pediculus pubis must be killed either by ung. hyd. amm. chlor., or by the application of chloroform. Ascarides may be treated by washing out the rectum daily for a fortnight with inf. quass. Oj, ferri sulph. 5j. In any case of pruritus the patient should be instructed that the effect of friction is to aggravate the condition on which the itching depends. In children it may be desirable to secure the hands during sleep, lest bad habits should be acquired. G. E. HERMAN.

PRUSSIC ACID, Poisoning by.—Prussic or hydrocyanic acid is chiefly obtained from the cherry laurel or bitter almond plants or from the kernels of peaches or apricots. Compounds containing the acid, such as essential oil of almonds, laurel water, bitter almond water or cyanide of potassium are almost as poisonous as the acid. Nitro-benzol, nitro-glycerin, and aniline produce poisoning in much the same way as prussic acid and call for the same methods of treatment.

Symptoms.—Sometimes the patient becomes insensible almost immediately, and dies within two or three minutes, but some cases do not prove so instantaneously fatal, though, as a rule, death, when it does occur, takes place early. A slow and irregular action of the heart and difficulty in breathing are at once apparent, then follow convulsions, ushered in, it may be, by a shriek; the pupils are widely dilated; the expiration laboured; cyanosis, vomiting and involuntary passage of urine and fæces, and complete loss of muscular power will be observed; finally, there is extreme collapse, pulselessness, cold clammy skin, stertorous breathing and death. Occasionally there is time for voluntary acts not requiring many seconds for their accomplishment to be performed. If the patient survive the first half-hour there is fair hope of his recovery, whilst, after an hour, re-

covery is almost assured. The almond-like odour of the poison may be noticed in the breath, but the absence of the odour would not militate against the diagnosis.

Post-mortem Appearances.—Cadaveric rigidity comes on early. The eyes are glassy, the pupils dilated, the nails livid, the fingers and toes contracted. The odour of the acid may be noticeable either before or after the opening of the body. The right side of the heart is generally engorged with blood, dark and fluid, sometimes thick; the lungs are engorged and œdematous; the bronchi contain frothy mucus. The brain, the stomach and intestines may or may not be congested.

Fatal Dose.—From 40 minims to 1 drachm of the pharmacopœial acid is usually a fatal dose. Scheele's acid is rather more than twice as strong.

Treatment.—To have any chance of success treatment must be prompt. Cold affusion to the neck and spine, or alternate douches of hot and cold water constitute the best means of stimulating the respiration, which is the main object of treatment. Stimulants may be given by the mouth if the patient can swallow, and ammonia should be held to the nostrils. Emetics should be given or the stomach pump used. Artificial respiration and the application of the induced current to the cardiac region are useful measures. The poison so soon gets into the blood that chemical antidotes can rarely be of any benefit, but a mixture of a proto- and a persalt of iron, followed by an alkaline carbonate, has been recommended, and might be given if at hand. But there would be no time to spare to make up such a mixture. The hypodermic injection of atropine $\frac{1}{16}$ gr. may be tried, but the other treatment above recommended is far more important.

PSEUDOCYESIS (Spurious Pregnancy).—It is not uncommon for women to be in doubt whether they are pregnant or not. But spurious pregnancy means more than this. The patient not only thinks she is pregnant, but has symptoms which to some extent justify the belief; and the spurious pregnancy is often followed by spurious labour. That the disorder is not simply the result of imagination is shown by the fact that similar phenomena have been observed in birds and other animals. The patients generally have some irregularity in menstruation; they say that the abdomen is enlarged and that they have had to let out

their clothes; that there has been sickness in the morning, and that the movements of a child have been felt. Sometimes the breasts have enlarged, and, if the patient have had children before, it may be possible to squeeze milk from them. In some cases these symptoms persist long after the expected date of delivery, and the patient seeks advice to ascertain the cause of the delay. Sometimes spurious labour comes on; there is a vaginal discharge, nurse and doctor are sent for, and find the patient in paroxysmal throes of pain. On physical examination, it is at once discovered that the patient is not pregnant. But it may not be easy, owing to the resistance of the abdominal muscles, to make a thorough examination, and it is generally difficult to convince the patient that she is in error. In a case in which absolute certainty is necessary, but its attainment difficult, an anæsthetic may be administered. When the patient is anæsthetized, the uterus can be grasped between the hands, and the absence of uterine enlargement, or the presence of any other tumour, satisfactorily established.

G. E. HERMAN.

PSEUDO-HYPERTROPHIC PARALYSIS.—A disease characterized by progressive muscular weakness, usually associated with an enlargement of some of the affected muscles. The morbid change is an interstitial fibrous overgrowth of the muscles, frequently accompanied by an accumulation of fat.

Symptoms.—Impaired muscular power and clumsiness, especially of the lower limbs, are usually the earliest appreciable symptoms. Very shortly, enlargement, usually symmetrical, of certain muscles supervenes, the disease then presenting the features to which it owes its name. Increased bulk, however, is by no means constant. In the course of time many of the muscles undergo diminution, sometimes differing little from the normal in size, sometimes becoming markedly atrophied.

It is important also to remember that enlargement is in rare cases absent throughout, the muscles either retaining their natural bulk, or exhibiting a variable degree of wasting.

The muscles of the calf are most commonly the earliest to undergo enlargement, the increase in bulk being sometimes extreme. The glutei, the extensors of the knee, the lumbar muscles, the infra-spinatus, the deltoid

and the triceps are especially liable to be affected. The muscles on the front of the leg, the supra-spinatus and the biceps are less frequently involved. The flexors of the knee and the muscles of the forearm usually escape, and the serratus magnus is rarely implicated. With the exception of the clavicular part of the sterno-mastoid, the muscles of the neck are rarely involved. The muscles supplied by the cranial nerves never suffer, with the exception of the tongue, which is occasionally enlarged. The pectoralis major is never enlarged, but its lower part, usually in conjunction with the latissimus dorsi, and sometimes also with the teres major, is frequently wasted. The weakness of this muscular group causes inability to depress the raised arm, and the atrophy gives rise to diminished size or almost complete absence of the posterior fold of the axilla. Occasionally these muscles appear to be entirely wanting, and it has been suggested that they may be congenitally absent. The masseters and temporal muscles have in rare instances been enlarged, but otherwise the face is rarely affected. The muscles of the hand almost always escape. It not unfrequently happens that portions of muscles are involved, and this has been particularly observed in the triceps, in the component parts of the muscular mass in front of the thigh, and, as has already been noticed, in the pectoralis major and sterno-mastoid. Impairment of power is said to be more marked in the wasted muscles, and as enlargement gives place to atrophy, the loss of power progressively increases.

The attitude and gait in pseudo-hypertrophic paralysis are characteristic. In the upright posture the legs are wide apart, the shoulders thrown back and often projecting beyond the buttocks, the lower part of the back strongly curved, and the abdomen pushed forwards. During progression the legs are widely separated, and the body swayed to one or other side. The gait thus presents a peculiarly awkward and waddling character. Great difficulty is experienced in rising from the floor, and the method which the patient adopts is almost pathognomonic. First he rests on the hands and knees with the head down, then by extending the knees the buttocks are raised and protruded. The hands grasp the thighs, and then by pushing upwards with each hand alternately, the trunk is gradually extended. When the extensor muscles of the knees are profoundly affected, the patient is unable to rise.

In course of time distortions of the joints are apt to occur. When the calf muscles diminish in bulk, talipes equinus and sub-luxation of the ankle-joints may supervene. The knee sometimes becomes permanently fixed from the unopposed action of the flexors, and by the contraction of the biceps the elbow may also become flexed. The antero-posterior curve of the spine, with the concavity backwards, has already been noticed. Dr. Gowers believes that it is due to weakness of the extensors of the hip, which permits the pelvis to incline forwards, carrying with it the lower lumbar vertebrae and the abdomen. The shoulders and upper dorsal spine are thrown backwards, in order to bring the centre of gravity over the feet. Lateral curvature from weakness of the spinal muscles may occur.

In the early stage of the disease, the reaction of the muscles to electricity is not altered. Later on, the faradic irritability is diminished, and, according to some observers, the galvanic contractility is normal or increased. Dr. Gowers, however, asserts that the latter is lowered, and that the reaction of degeneration is never present. The knee-jerks at first are feeble, and finally disappear. Sensation remains unaffected. The power over the sphincters is preserved, except in rare cases, when towards the end some difficulty in retaining or voiding the urine is experienced. Mental weakness, sometimes congenital, sometimes supervening during the course of the disease, is frequent.

Course. — Pseudo-hypertrophic paralysis is a slowly progressive malady. Its duration is variable, and life may be preserved for twenty years or even more. But long before death, often after the lapse of ten years or thereabouts from the onset, there is inability to stand. Death usually results from pneumonia or phthisis.

Diagnosis. — When there is enlargement of the calves and buttocks, there is little or no difficulty in arriving at a correct diagnosis. The gait and the mode of rising from the floor are also very suggestive. Dr. Gowers asserts that enlargement of the infra-spinatus muscle, combined with wasting of the latissimus dorsi and lower part of the pectoralis major, is rarely absent.

The attitude of the lower limbs and the gait in infantile spasmodic paraplegia sometimes suggest pseudo-hypertrophic paralysis. In the former, however, the legs are in a state of active spasm, the knee-jerks are commonly

exaggerated, and the peculiar method of rising from the floor is absent. Serious difficulty in diagnosis, however, only arises in those exceptional cases of pseudo-hypertrophic paralysis in which the muscles are wasted and when there is no history of antecedent enlargement. Under such circumstances, confusion is apt to arise between this disease and various forms of muscular atrophy of spinal and idiopathic origin. In infantile paralysis, the sudden invasion, the acute wasting, the electrical reactions and the distribution of the paralysis, are the main distinguishing characters. In other forms of atrophy from spinal disease, the seat of the paralysis, the altered reactions to electricity, and the frequent implication of the muscles of the hand, are usually sufficiently distinctive. In the disease known as "idiopathic muscular atrophy," believed by many to be allied to pseudo-hypertrophic paralysis, several members of the same family are often affected, there is no antecedent enlargement of muscles, and the muscles of the face are sometimes affected.

Morbid Anatomy and Pathology.—After death the muscles are found pale or yellowish, and often appear to be replaced by fatty tissue. Under the microscope an abundant nucleated fibrous tissue, usually with an excessive amount of fat, is seen between the muscular fibres. Adipose tissue may however be scanty or absent, especially in the late stage, and occasionally even throughout the disease. The muscular fibres at first present no marked changes. Later on they become narrow and irregular. The transverse striation often persists until an advanced stage, though occasionally, even in the early stage, it is faint here and there or the intervals between the striæ are wider than normal. Eventually, the fibres may become granular or fatty, finally dwindling until nothing is left but empty sarcolemma sheaths. The destruction of the muscular fibres is said to be more general when the interstitial tissue is almost entirely fibrous. Many normal fibres are seen in those muscles in which there is an abundant amount of interstitial adipose tissue. The motor nerves have always been found normal. In a few instances changes have been described in the spinal cord. It is now, however, admitted by nearly all authorities that the disease is a primary affection of the muscles, and that the wasting of the fibres is due to an interstitial growth.

Ætiology.—Males are much more fre-

quently affected than females, the proportion being about six of the former to one of the latter. The disease is often noticed shortly after the child begins to walk. In the great majority of cases the onset occurs before the age of ten, but a few cases have been recorded in which the disease began in adult life. Several members of a family are often affected, and, as in hæmophilia, the disease is always transmitted through the mother, although she is not herself affected with it.

Treatment.—Various drugs have been recommended, such as arsenic, phosphorus, strychnine, and cod-liver oil, but these remedies have little influence over the course of the disease. Friction, massage, passive movements, gymnastics, have sometimes been used with advantage. Duchenne strongly recommended the faradic current, which is especially effective in the early stages. When the calf-muscles become so contracted that the patient is unable to stand, division of the tendons should be performed. Great care should be exercised to guard the patient from intercurrent maladies, especially of the respiratory organs.

W. B. HADDEN.

PSORIASIS (Lepra; Dry Tetter).—

A chronic inflammatory disease of the skin, characterized by the presence of silvery white scales adherent to and covering dry, reddish, primarily rounded, raised patches. It occurs chiefly on extensor surfaces and is very prone to relapse.

Eruption.—The disease begins as minute red papules which rapidly become surmounted by pearly scale (*P. punctata*). These spread peripherically and soon resemble drops of mortar (*P. guttata*); when they attain the size of a coin, the name *P. nummularis* has been applied to them. By coalescence of these, larger patches are produced (*P. diffusa*), the outline of which is festooned, convex outwards. Recovery begins in the centre of the patches causing a ringed appearance (*P. circinata*), composite patches thus assuming serpiginous outlines (*P. gyrata*). The patches are always distinctly raised, and in old-standing cases are often markedly so; they are well defined and sometimes form a distinct rim outside the scale. Their colour is at first a vivid red, but afterwards it becomes duller and brownish. Pigmentation is often very deep—like that of Lichen planus or dermato-syphilis—in very chronic cases, in cases treated

freely with arsenic and in lesions situated below the knee. The scales are most abundant and most typical in recent patches; they are pearly white, lustrous, dry not greasy, and are easily separable from the subjacent raised patch, the surface of which presents numerous small, reddish points, from which a little blood may ooze, but which never discharge serous fluid. In a variety of the disease, to which the name of *P. rupioides* has been given, the scales are excessive in quantity and piled up like the shell of a limpet, but confusion with syphilitic rupia is, after careful examination of all the features of the disease, hardly possible. Itching is a frequent but by no means invariable symptom of the disease. As a general rule, its severity is proportional to the acuteness of the inflammatory process, and it is seldom so troublesome in the young, as in old, possibly gouty, persons.

The *Sites of Election* are the fronts of the knees, just below the patellæ, and the tips of the elbows, in both of which situations patches may persist for years, before a general outbreak occurs over the body, or between such outbreaks. Generally speaking, extensor surfaces are far more prone to be attacked than flexor surfaces, and the eruption as a rule presents remarkable symmetry. The scalp is a frequent seat of the affection; the circular outline of the patches there is generally masked by surrounding seborrhœa, but if the disease spread to the forehead or behind the ears, as it often does, its nature is revealed. On other parts of the face it is rather rare. Patches often occur on the trunk, especially on the front of the chest and over the sacrum, particularly in the psoriasis of advanced life, in which the distribution is often asymmetrical, scaling inconspicuous and itching excessive (Liveing). The scrotum and penis are seldom involved: very rarely, also, the palms and soles. So-called *palmar psoriasis* is almost always a dry eczema or squamous syphiloderm; a few cases of true psoriasis of the palms and soles have been observed, and there seems some reason to think that it is specially liable to become the starting-point of a pityriasis rubra, or, after having become "verrucose," to develop malignant, epitheliomatous characters. When psoriasis affects the nails they become opaque, thickened and brittle, the matrix beneath being much heaped up; the condition is specially intractable. Occasionally the distribution appears to be determined by

pressure, e.g., of garters, or by previously existing skin lesions, such as the scars left by varicella.

The *course* of the disease is essentially a very chronic one; its tendency to recur, sometimes after perfect recovery and at regular intervals, varying in different cases, is very marked, and must compel one always to give a guarded prognosis. The occasional supervention of general pityriasis rubra even in mild and localized cases must also be borne in mind.

The *diagnosis* is seldom a matter of difficulty, but an ill-developed or abnormally distributed eruption, or one under treatment of any sort, may be mistaken for one of the following diseases—viz., dermatosyphilis, lichen ruber, chronic dry eczema, pityriasis rubra, ichthyosis, lupus erythematosus (of the face), tinca tonsurans or seborrhœa (of the scalp), pityriasis rosea. Into the several points of differential diagnosis it is here impossible to enter.

Morbid Anatomy.—The pathological changes begin in the rete Malpighii, where rapid cell-formation occurs, resulting, on the one hand, in enormous increase in the cells of the upper horny layers of the epidermis, from premature conversion and imperfect cornification of the rete cells, and on the other, in increased development of the rete layers, except over the papillæ. The result is great downgrowth of the inter-papillary processes, with consequent hypertrophy, congestion, œdema and diapedesis. The upper part of the corium, especially round the hair follicles and sweat-ducts is also the seat of moderate inflammatory changes, almost certainly secondary to those in the rete. In very chronic cases the deeper layers of the corium may become involved.

Ætiology.—Very little is really known of the ætiology of psoriasis. Heredity is certainly the most powerful factor. Whilst generally appearing in persons in perfect health, it not infrequently attacks those suffering from lowering conditions, e.g., pregnancy, lactation. On the other hand, plethora may produce it, and alcoholism certainly generally aggravates it. Spring and autumn seem more favourable for its appearance than summer or winter. Psoriasis is very rare before the age of five years. Whether or not the psoriasis of advanced life is to be attributed to gout or "the gouty condition" is a subject of dispute. The arguments *pro* and *con* appear to the writer about equally balanced, nor does his personal

experience justify any decided expression of opinion upon his part. Of course, micro-organisms of a supposed specific nature have been found in the scales, but some few clinical facts and inoculation experiments reported from Germany which seem to support this view of the ætiology of psoriasis, have been received with scepticism in this country.

Treatment ought to be both constitutional and local, many cases in which subjective symptoms are absent and local remedies not employed, yielding readily to the former alone. Any marked derangement of the general health (anæmia, plethora, dyspepsia, constipation or gout) must be dealt with in the ordinary way. Among drugs considered as specific, arsenic holds the first place, and it certainly exerts a potent influence over the disease; it must, however, be used with due caution and full knowledge of the limitations of its applicability. It is unsuitable, even deleterious, in acute, inflammatory cases, and, generally speaking, is more useful in psoriasis of the young than of the old. It ought never to be prescribed unless the tongue be clean, and the digestive functions in order. Then it may be administered in small doses at first, rapidly increased until the maximum dose is attained, individual susceptibility varying greatly as to its tolerance. Itching of the eyelids, diarrhœa, gastric pain or uneasiness are indications to diminish the dose; bronchial catarrh is certainly a frequent result of its administration, but there is some doubt as to the asserted frequency of the development of herpes zoster during its use. The deep pigmentation of the patches produced by its prolonged employment has already been alluded to. The liquor is the preparation most generally employed, usually in combination with alkalies and a bitter infusion, but arsenious acid (gr. $\frac{1}{30}$ or more) and arseniate of soda (gr. $\frac{1}{12}$ or more), are perhaps equally efficacious and may be conveniently prescribed in pill form with sugar of milk and compound tragacanth powder. Arsenic is always best given after meals accompanied by a copious draught of water; opium may be combined with it to prevent or counteract gastric irritation. Hebra's well-known "Asiatic pill" is seldom borne by the English stomach. Antimonial wine is sometimes of use when liq. arsenicalis disagrees.

Carbonic acid internally (gr. j to gr. iij in pill) is occasionally of value, and oil of turpentine has lately been highly

lauded by Dr. Crocker. He gives from 10 to 30 minims with 2 minims of oil of lemon in half an ounce of mucilage of acacia and of water, immediately after meals, three times daily, the last dose not later than 6 P.M., and directs that during treatment at least a quart of barley water be drunk daily.

In strumous persons cod-liver oil and iron are of special service, and with them arsenic may be easily and conveniently combined, a liberal diet being allowed. In gouty conditions colchicum, iodide of potassium, and alkalies may be prescribed with advantage, and due dietary restrictions must be observed. In such cases vegetarianism is sometimes attended with the best results. In inveterate cases a prolonged stay at La Bourboule, Buxton, Harrogate, Strathpeffer, or Kreutznach may prove efficacious.

Local treatment is, however, necessary in the great majority of cases, and may, of itself, prove curative, although, of course, in no sense preventive of future relapses. Acute outbursts must always be treated by perfect rest, the affected parts being covered with rags soaked in olive oil or calamine liniment. It is also important to remember that psoriasis in advanced life is much more liable to be irritated by stimulating applications than in early life.

If the disease be chronic the first condition necessary for the successful application of local remedies is the removal of all scales. Hebra's method, of rubbing in soft soap vigorously until all crusts are removed and some bleeding produced, is unnecessarily severe and by no means more successful than prolonged bathing, say for half an hour or more, every night and morning in a warm alkaline bath containing about three ounces of carbonate of potash; the body ought to be well soaped afterwards and friction with a soft towel employed. For the scalp a shampooing liquid, consisting of equal parts of soft soap and alcohol (Hebra's spiritus saponis kalinus), is especially applicable for the same purpose.

Afterwards stimulating applications are suitable, the most frequently employed being the preparations of tar. It is also advisable to use them at first over a limited area and dilute, their strength being gradually increased according to the tolerance of the patient and the amount of stimulation necessary. The official unguentum picis liquidum is a powerful but disagreeable remedy, and other more elegant preparations are now generally employed. Liquor carbonis

detergents may be painted on to very chronic patches with a hard brush, may be used dilute (5j ad 3vj) as a lotion, or combined with lard, lanolin, vaseline, or other convenient vehicle as an ointment. The oleum rusci, oleum cadini, and oleum fagi—in strength varying from 5ss to 3iv ad 3j—are also excellent. Naphthol and thymol (5j or more ad 3j) are useful, either in ointments or lotions, to allay itching.

The red oxide of mercury ointment is often very efficacious, especially for the scalp and exposed parts, as it causes no disfigurement, and the other mercurial ointments have some value as stimulants. Chrysarobin is certainly the most powerful local remedy we possess against psoriasis, but it requires careful watching, and should always be applied over a small patch at first, as it is apt to cause severe dermatitis. It also has the disagreeable property of staining the skin, clothes, and everything with which it comes in contact a bright yellow. It may be used in the form of the official ointment, but is more efficacious, less dangerous, and not at all dirty when a ten per cent. or stronger solution in traumaticine is painted over the part—traumaticine being a ten per cent. solution of gutta percha in chloroform. Unna's chrysarobin mull-plasters may also be used with advantage in some localised cases.

A somewhat similar remedy is pyrogallie acid, which is much used, but causes conspicuous black discoloration. It is employed as Jarisch's ointment (gr. xx to 3j ad 3j); its absorption sometimes gives rise to hæmaturia and other toxic symptoms.

Localized excessive thickness of scale may be removed by salicylic acid in collodion (gr. xx ad 3j).

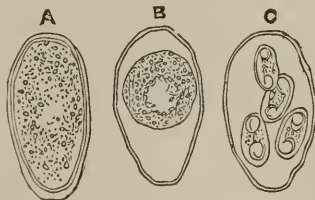
Finally, wrapping the part affected—if limited—in an elastic bandage or other form of impervious india-rubber covering is often of itself curative.

J. J. PRINGLE.

PSOROSPERMIA.—It has long been known that rabbits are liable to a disease which often assumes epidemic proportions in warrens. Its chief clinical symptoms are the following:—The animals are noticed for some weeks to be sickly, to become thin, and to lose their activity and appetite; breathing is quick and violent, convulsions set in, and are followed by death. On examining rabbits dying in this way the liver will be found dotted with small white nodules, varying

in size from a mustard seed to a hazel nut, but they rarely exceed the dimensions of a split pea. Adjacent nodules may be connected by bands of tissue resembling cicatrices. The nodules are especially abundant beneath the serous membrane, but they also occur in the substance of the organ and in a well-marked specimen the cut surface of the liver will present numerous white dots. This circumstance induced some writers to describe the nodules as tubercle, others regarded them as cancer. To Leuckart we are indebted for the discovery of their true nature. When a piece of liver containing such nodules is hardened and sections prepared for the microscope, we find that they consist of dilated bile-ducts. The walls of the central cavity are lined by epithelium and processes often project from the lining membrane into the cavity, giving it a villous appearance. The true lining of the cavity is separated from the liver substance by a capsule of dense connective tissue. The interior of the nodule is occupied by a multitude of oval bodies, known as *coccidia oviforme*. The coccidium is described by Leuckart as egg-shaped, 0.033 to 0.37 mm. long and 0.015 to 0.02 mm. wide, with thick smooth shells, possessing at one end, usually the narrower, a micropylar opening. The coccidia resemble very closely the eggs of certain entozoa; some observers regarded them as the eggs of *Distoma lanceolatum*, some still believe them, not without reason, to be the eggs of parasites. Leuckart rejects this view and describes them in their early stages as non-capsuled inhabitants of the epithelial cells of the bile-ducts. This is very questionable. As the coccidia develop they become invested with a tough membranous capsule. At first they are filled throughout with granular material as Fig. 1, A; at a later

FIG. 1.



Coccidium oviforme in its various stages.

stage this becomes collected into a ball, as in B. This change is probably accompanied by an alteration in their composi-

tion, for in the early stage A they stain with methyl violet, whilst stage B stains best with fuchsin. Staining with any material is a matter of difficulty, on account of the thickness of the capsules. The coccidia undergo no further change in the tissues; they may escape from the bile-ducts into the intestines and be thus evacuated. In the rabbit the escape from the bile-duct is rendered possible by the fact that the cavities in the various nodules are connected by intervening passages. After escaping from the rabbit either by accidental expulsion, or, more commonly, when the animal dies, the coccidia, after a period of incubation varying from a few days to several weeks (the difference in time depending on temperature and the nature of the medium), undergo metamorphosis and the capsule is found to contain four ovoid spores, or psorosperms as they are sometimes called, Fig. 1 C. At this stage the spores so strongly resemble the pseudo-navicellæ of an encysted Gregarine that many have been content to regard coccidia as Protozoa. The shells of the coccidia possess considerable power of resistance, and it has been found that when placed in preservative and hardening media such as weak solutions of chromic acid and Müller's solution, development proceeds as usual, and even seems to be carried on with more vigour than when simply placed in water.

The term psorosperm seems to have been introduced by J. Müller, *Archiv*, 1841. "Ueber eine eigenthümliche krankhafte parasitische Bildung mit specifisch organisirten Samenkörperchen" (Psorospermia). The derivation of the term is obvious, for the parasitic disease about which Müller wrote affects the gills, skins, and muscles of fish and frogs as well as the kidneys and bladder. The Greek word, $\psi\omicron\rho\alpha$ or $\psi\omicron\rho\eta$, signifies a cutaneous disease, the itch, scab, or mange, and its Latin equivalent is *scabies*. The French use the word *Psore* as a generic title for vesicular and pustular maladies of the skin. The skin disease of fish and frogs described by Müller consisted of small sacs containing oval bodies, some of them with and some without tails, hence he termed them psorosperm-sacculi.

To return to the coccidia, whatever they be, whether immature forms in an intermediate host or Gregarinidæ, they are the cause of this destructive disease of the rabbit, and are so frequent among them, that out of five hundred rabbits imported from Holland for dis-

section purposes sixty to sixty-six per cent. had an abundance of coccidium nodules in the liver.

This disease occurs in other mammals and in birds; it is occasionally seen in the human subject. One of the earliest cases was recorded by Gubler in 1858. The patient, a stone-breaker forty-five years of age, suffered from disordered digestion, bad appetite, sour stomach, and anæmia. He had a dull pain over the liver, and was of cachectic appearance. The liver was enlarged, and a spherical tumour could be made out in the neighbourhood of the gall-bladder. The anæmia increased; the man had violent pain in his body, fever, feeble pulse, bilious vomiting; collapse and death followed a night of delirium. At the post-mortem examination the immediate cause of death was found to be peritonitis. The liver contained twenty tumours, some of the size of chestnuts, others as big as an egg. The large tumour felt in the liver during life was about 15 cm. in diameter. The encapsulated tumours contained thick fluid of greyish-brown colour, containing countless egg-like bodies, which are now known, thanks to Leuckart, to be coccidia. Gubler (*Mém. Soc. Bio.* 1858) regarded these bodies as the ova of *Distomum* (liver-fluke). The brief history of this case is sufficient to show that the symptoms induced by coccidia in man are similar to those displayed by the affected rabbits.

Cases in man similar to the one described by Gubler have been reported in Germany by Dressler, Perls, Eimer, and others. One of Perls' cases was a preparation from Sömmerring's collection at Giessen. The earliest case recorded in our home literature is described by Dr. Hadden, in the *Transactions of the Pathological Society*, vol. xxxiv. (1883), under the title "A Case of Disseminated Sarcoma." This, in the light of subsequent events, we know to be a fatal instance of psorospermia. Its chief features are briefly these:—A gentleman thirty-eight years of age had long complained of occasional pain in the region of the heart. When admitted into St. Thomas's Home he was dull and heavy, with slight occasional elevations of temperature; the drowsiness and dullness increased, followed by low muttering delirium and partial unconsciousness, ending in death. The case was under observation fourteen days. At the post-mortem examination the visceral and parietal layers of the pericardium were

found dotted with numerous slightly raised round white nodules of new growth. Similar nodules existed throughout the muscular substance of the heart and endocardium; the valves were free. The parietal layer of the pleuræ, both surfaces of the diaphragm, mesentery, and omentum were dotted with nodules. The liver and spleen contained several sub-capsular deposits; a few existed in the substance of these organs. Similar nodules were found in the kidney, in the arachnoid and convex surfaces of the brain. The nature of the case was detected by Dr. Cobbold, to whom the Morbid Growths Committee submitted sections of the nodules. Cobbold pronounced them to be psorospermial sacs.

In 1889 Mr. Eve exhibited at the Pathological Society, London, a specimen of psorospermia of the ureter and kidney from a woman aged fifty-one years who was taken suddenly ill. The chief symptoms were hæmaturia and frequent micturition. Death took place from anæmia and exhaustion on the seventeenth day.

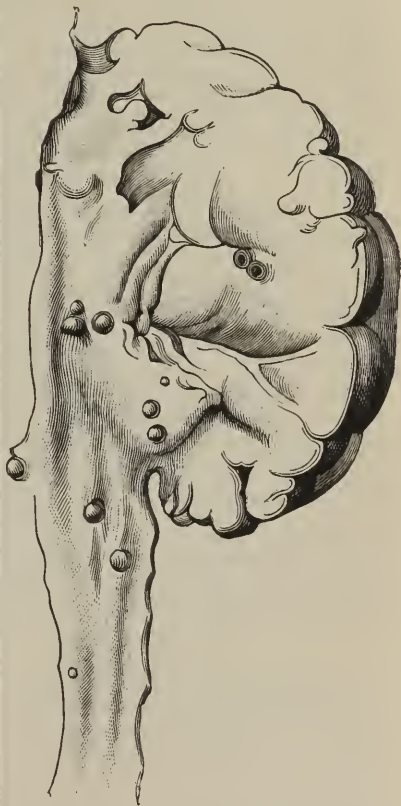
The general appearance of psorospermial saccules in the ureter may be gathered from Fig. 2, taken from a specimen in the museum of the Middlesex Hospital, where it has long been preserved as an example of mucous cysts of the ureter. The parasitic nature of the nodules was suspected by the writer of this article, and on submitting them to microscopical scrutiny they were found to contain coccidia; a few of the nodules were calcified. Mr. Targett has detected in the museum of Guy's Hospital a similar specimen from a young man aged thirty years who was under Dr. Bright's care fifty-three years ago.

As yet we are imperfectly acquainted with the clinical symptoms of psorospermial affections of the ureter. In addition to the functional disturbance they set up, they may produce mechanical effects, for Dr. Joseph Griffiths, of Cambridge, has met with a case in which these nodules in the ureter induced hydronephrosis.

By far the most complete case of psorospermia yet described in Great Britain is one reported by Mr. Q. Silcock. A woman aged fifty-three years was admitted to St. Mary's Hospital seven days before death. She was thought to be possibly suffering from typhoid fever. The illness dated from a chill taken seven weeks before death. The symptoms consisted in pains in the limbs, nausea, and occasional sickness, tenderness over the liver

and spleen, fever of remittent type, the temperature reaching 103° , and slight diarrhoea. The urine was albuminous; the splenic and liver dulness increased; the tongue coated with brown fur, becoming dry; the breath foul. Death resulted from cardiac failure. The liver was much enlarged, weighing eighty-three ounces. In its substance were a

FIG. 2.



Portion of a kidney and ureter showing nodules due to *Coccidium oviforme*. (From the Museum of the Middlesex Hospital.)

number of aggregations of caseous foci, for the most part near the surface, there being generally a well-marked red ring of congestion or capillary hæmorrhage around each caseous area. The spleen was enlarged, weighing sixteen ounces, and exhibited similar caseous foci varying in size from a pin's head to that of a pea, arranged in aggregations, and with

a red inflammatory zone around each nodule. In the ileum were found six papule-like elevations, with red bases and circumferential inflammatory zone; also in the large intestine, as well as in the ileum, were red patches of infected mucous membrane, from one to three inches square. A small pneumonic area existed in the anterior border of the left lung; the other organs and tissues presented no noteworthy change, except those associated with fever. The macroscopic appearances to a certain extent resembled those of tuberculosis, but differed in the character, situation, and generalisation of the lesions. On microscopic examination the nodules were found to contain coccidia, and in their relation to the bile-ducts corresponded to the disease as seen in rabbits.

These constitute all the cases of psorospermia in man which have been recognised in this country.

There is reason to believe that psorospermial infection is not confined to internal organs, for M. J. Darier gave in the *Annales de Dermatologie et de Syphiligraphie*, 25 Juillet 1889, under the title "De la Psorospermose folliculaire végétante," reasons for the belief that man is liable to certain cutaneous affections due to the presence of psorosperms and coccidia. These parasites may invade the orifices of the follicular ducts of the skin, and, by their accumulation, plug the orifices of the follicles. Among other things, Darier thinks that chronic eczema of the nipple and molluscum contagiosum may be due to this cause. These statements are very suggestive, and require thorough investigation.

J. BLAND SUTTON.

PTOMAINES (Animal Alkaloids).—Alkaloids produced by the decomposition of animal substances.

The word *ptomaine*, which is derived from *πτῶμα*, a corpse or dead body, and *inus*, belonging to, was at first restricted to alkaloids produced by cadaveric decomposition, but it is now also employed to designate alkaloids of animal origin formed during life as a result of chemical changes induced by some agency or other acting within the organism.

The term *leucomaine* has recently been introduced to particularise the animal alkaloids formed during life from those produced by decomposition of dead animal matter; it is probable, however, that in the near future the terms *ptomaine* and *leucomaine* will be dropped,

and that these bases of animal origin will be classed in one category as *animal alkaloids*.

It is only within the last few years that the existence of the ptomaines has become known. In 1866, Dupré and Bence Jones found an alkaloidal substance, resembling quinine in some of its properties, in the liver. In 1868, Bergmann and Schmiedeberg obtained from putrid beer a nitrogenous crystalline substance, which they called *sepsine*, and which was subsequently thought to be present in septicæmic blood. In 1870, Gautier commenced his researches on putrefying albuminous substances. In 1877, Selmi announced that by subjecting pure albumen to putrefaction he had been enabled to produce and separate two new alkaloids. Since then, Gautier has made a series of elaborate and prolific researches, as the result of which several animal alkaloids have been discovered.

Creatinine, xanthine, hypoxanthine, guanine, carnine and betaine, all genuine alkaloids, were found in the tissues of animals or in their excrementitious products. Creatinine, discovered in urine by Liebig and Pettenkofer, was the first body of animal origin acknowledged to be an alkaloid. Later on, Liebrich detected the already known vegetable alkaloid betaine in normal urine. In 1880, Pouchet detected carnine in the urine of man, and this was confirmed in 1881 by Gautier, who showed that it possessed the general properties of a ptomaine. In 1882, Bouchard demonstrated that not only were alkaloids present in appreciable quantities in normal urines, but that they augmented notably in the course of certain maladies, typhoid fever for instance; and later, Lepine and Aubert concluded that these alkaloids in the urine increase in quantity until the crisis of a disease is reached, after which they diminish (no alkaloid was isolated in connection with any disease in sufficient quantity or sufficiently pure to admit of its ultimate composition being determined). It has also been shown that in the course of uræmia there is a notable increase of creatinine in the urine. Since 1882, Gautier, as the result of his investigations, has affirmed, that the incessant production of alkaloids at the expense of albuminoid materials is a function of all the animal tissues, and is an essential concomitant of the vital phenomena of all living things, animal and vegetable.

The following ptomaines have been ex-

tracted from human corpses and their composition determined by analysis:—

Putrescine ($C_4H_{12}N_2$).

Cadaverine ($C_5H_{16}N_2$).

Neurine ($C_5H_{13}NO$).

Choline ($C_5H_{15}NO_2$).

Putrescine and cadaverine have also lately been found by Jauksch in fæces.

The following is a list of the principal animal alkaloids that have been extracted from the secretions of living beings, and from animal tissues:—

Creatinine ($C_4H_7N_3O$).

Pseudoxanthine ($C_4H_5N_3O$).

Sarkine ($C_5H_4N_4O$).

Xanthine ($C_5H_4N_4O_2$).

Crusocreatinine ($C_8H_8N_4O$).

Xanthocreatinine ($C_8H_{10}N_4O$).

Guanine ($C_5H_5N_5O$).

Carnine ($C_7H_8N_4O_3$).

Betaine ($C_5H_{11}NO_2$).

Some of these alkaloids are toxic, inducing somnolence, purgation and vomiting.

Animal alkaloids have also been detected in the liver, brain, heart, lungs, spleen, and saliva of man. The poisonous effects of certain shell-fish (mussels, &c.) have been shown by Brieger to be due to a ptomaine which he has named *mytiloxine* ($C_6H_{15}NO_2$).

The animal alkaloids that are being incessantly produced within our bodies as a result of the normal physiological processes of life are eliminated by the bowels, kidneys, liver, skin and lungs, but if from any cause these eliminating organs fail to perfectly fulfil their excretory functions, then an accumulation of these alkaloids in the circulation occurs, and a toxic action is exerted by them on the nervous centres. In this way can be explained the headache resulting from constipation, and the more serious nervous symptoms resulting from deficient excretory action of the kidneys in certain diseases of those organs. But it is not only on the excretory organs that the removal of these animal alkaloids depends, for a powerful agent is at work, in the oxygen of the blood, which is continually oxidizing them and burning them up, and it seems probable that this combustion, to a large extent, occurs in the liver.

If, the emunctories remaining sound, there be excessive production of animal alkaloids, but inadequate elimination—a condition which is obtained in all forms of over-exertion, as in a prolonged march—then accumulation of material, elaborated in excess and imperfectly eliminated, occurs, an auto-infection, a temporary poisoning of the system results,

the poison affecting the nervous centres and producing the fever of over-exertion, the fever of prostration.

With regard to the possible relation of the ptomaines to the infectious fevers, one view is, that after the admission of the specific micro-organisms into the body, and provided they find the conditions suitable, they live and multiply, and that, as a result or as a residuum of their vital activity, a powerful alkaloidal poison is produced, the toxicity of which is the cause of the symptoms of the disease. If this view be correct, then each infectious fever is the result of a fermentative decomposition of albuminous matter within the body, induced by a special micro-organism manufacturing its own peculiar poison for each disease. But in many non-contagious diseases it seems probable that, without the intervention of micro-organisms, abnormal chemical changes may result in the formation of poisons which exert a toxic influence on the body within which they are produced.

The facts and experiments that can be brought forward in support of these views are necessarily, at the present time, meagre, but they are suggestive. Pouchet has extracted from the fæces of a cholera patient an alkaloidal body, which injected into animals produces slowing of the heart, and later, death, followed quickly by rigor mortis. The same author, and also Nicati and Rietsch, have obtained from cultivations of Koch's cholera bacillus traces of an alkaloid which appeared to be identical with the preceding one. Again, from cultivations of the typhoid bacillus Brieger obtained a small quantity of a poisonous alkaloid that he calls *typhotoxine*, and which yielded reactions different from the alkaloids he had previously isolated from putrefying animal matters. Quite recently Dixon Mann has extracted from the abdominal and thoracic organs of a patient dying of typhoid fever during the third week of the attack, an alkaloid which, however, differed in some of its reactions from the typhotoxine of Brieger. Dixon Mann has also extracted from the organs of a patient dying of septicæmia, of unknown origin, a small quantity of an alkaloidal poison. Brieger from cultivations of the tetanus bacillus extracted four ptomaines, all of which when injected into mice produced tetanus. Lastly, and most recently, the writer has extracted from the urine of typhoid-fever patients a ptomaine, and also one from the urine of scarlet-fever patients. Both of these ptomaines are

absent from normal urine, and in their properties and reactions they differ from any previously known ptomaine.

ARTHUR P. LUFF.

PTOSIS.—A drooping of the upper eyelid and inability to raise it, from paralysis of the levator palpebræ superioris. It is seldom so complete as to conceal the whole of the eyeball. In the majority of cases, when the lid is raised the pupil will be found dilated and the eyeball turned outwards, the whole being due to paralysis of the third nerve. Partial drooping may be caused by chronic inflammation of the lids (granular lids), or it may be the result of a blow, and is then usually transient, or it may depend upon paralysis of the sympathetic nerve in the neck. It is often congenital, and is then commonly bilateral (see **FOURTH NERVE, DISEASES OF**; **THIRD NERVE, PARALYSIS OF**).

PUERPERAL FEVER (Metria).

—A severe and generally fatal febrile disease occurring after delivery. The term "metria" has been proposed and adopted by the Registrar-General as equivalent to it, and is less open to objection. Many different theories have been held as to its nature, and still find defenders. Before describing what puerperal fever is, it will conduce to clearness to state what it is *not*.

1. It has been, and still is, maintained that puerperal fever is a *specific disease*, peculiar to lying-in women, not occurring in any other subjects. This view now has very few supporters, and their number is diminishing.

2. It is thought by some, that many cases of puerperal fever are due to the poison of *zymotic diseases*, more especially *scarlet fever*, which, when introduced into the body of a lying-in woman, produces a peculiar disease closely resembling septicæmia, and, indeed, not to be clinically distinguished from it. The evidence adduced in support of this view, consists of cases of illness resembling septicæmia, in which, after the illness, a search for some way in which the patient might have been infected with septic poison, resulted in failure to discover it; while inquiry directed to finding a possibility of infection from a scarlatina case, revealed some way in which this might have happened. It is concluded, from such cases, that the illness was due to scarlatina, and could not have been ordinary septicæmia. It will be seen that, for the validity of this

argument, it must be assumed that if a source of septic infection was not found, none existed. It is not possible to assert that this is the case, and, therefore, arguments based on such cases are far from conclusive. Against them there is the evidence of epidemics of scarlatina observed in lying-in hospitals in which proper precautions against septicæmia were taken. In these epidemics, the only illness scarlatina produced in lying-in women, was a disease differing in no important respect from scarlatina in other persons. The conclusion follows that the cases in which scarlatina was supposed to have produced septicæmia, were either cases of ordinary septicæmia or of scarlatina complicated with septicæmia. *Scarlatina produces in lying-in women scarlatina and nothing else.*

3. Many observers think that there is a close connection between *erysipelas* and puerperal fever. They have undoubtedly this in common, that the propagation of each disease is favoured by bad ventilation and uncleanness: and therefore, in places, and at seasons, when these conditions occur, these diseases, if once introduced, are apt to spread, and thus the apparent epidemic prevalence of the two is likely to coincide. The question of their relationship has been rendered obscure by the fact that under the term "*erysipelas*," two diseases have been included, which modern research has shown to be different from one another; and one of these diseases produces a form of puerperal fever, the other does not. One of these diseases is called "simple" or "cutaneous" *erysipelas*. It affects the skin only; is transmitted by contagion through the atmosphere; is characterized by redness of the skin with a distinct margin; and is produced by a definite microbe (the *erysipelas coccus* of Fehleisen), which is found in the lymphatic vessels of the skin at the advancing edge of the disease, but seems to be destroyed in the morbid process, for it is not found in the parts where the disease is older. This disease, when given to puerperal women, produces the same symptoms, and runs the same course, as in non-puerperal patients. *Simple cutaneous erysipelas produces in puerperal women erysipelas and nothing else.* The other disease is called "cellulo-cutaneous" or "phlegmonous" *erysipelas*. This affects the cellular tissue, and not the skin only. It is not produced by atmospheric contagion; the redness of the skin has no defined edge; the diseased parts contain micrococci which

are different from those of cutaneous erysipelas, and are found in all parts affected by the disease, and not at the advancing edge only. This disease may occur in puerperal women, and is one of the diseases classed under the term puerperal fever.

4. Puerperal fever has been ascribed to epidemic influences, that is, to an atmospheric or telluric influence or contagion, such as produces epidemics of smallpox, scarlet fever, influenza, &c. But examination of mortality records shows that epidemics of puerperal fever are unknown. This disease is present at all times of the year, and in about the same frequency at each season. It is slightly more common in winter and spring, when variable weather leads to neglect of ventilation.

5. Among causes to which particular cases are often assigned, are the following: chills, grief, excitement, shame (in the case of unmarried mothers), blood changes, such as hyperinosis, hydræmia, suppression of milk, deficient excretion, &c. All these causes occur just as often in lying-in hospitals where antiseptics are used as they do anywhere else, but in these hospitals they are not found to cause fever.

All accurate knowledge of puerperal fever dates from the time of Semmelweis, who, in 1847, showed that puerperal fever was caused by inoculation of the patient with decomposing organic matter, and that by taking precautions to prevent such inoculation, puerperal fever could be prevented. At that time, the influence of micro-organisms in causing the decomposition of organic matter was not known. Since then, the researches of Pasteur and Sir J. Lister have carried our knowledge further, and we now know that puerperal fever is due to the access to the patient of certain micro-organisms. The precautions introduced by Semmelweis were very rough as compared with those now in use, and therefore, some cases of fever occurred in spite of them. Semmelweis supposed that these patients infected themselves, and he therefore divided cases of puerperal fever into two classes, those infected from without, and those self-infected. These terms, translated into Greek, appear in some text-books of to-day as "heterogenetic" and "autogenetic." This classification is a delusive one, because (1) all our present knowledge goes to show that there is no such thing as self-infection; (2) if there be, we cannot in any way distinguish an

"autogenetic" from a "heterogenetic" case, and (3) if we could, it makes not the slightest difference in treatment or in prognosis. It may therefore be confidently stated that *puerperal fever is a wound disease*.

In the process of parturition, the cervix uteri, the vagina, and the vulva, are often, indeed usually, torn. The same diseases may result from these wounds, as result from wounds elsewhere. The wounds caused in parturition are more likely to become the seat of diseased processes caused by microbes than wounds of similar size elsewhere, because they are bathed with the copious lochial discharge which offers a fertile soil for the multiplication of germs. The wounds of the vaginal orifice are probably those through which poison generally gets into the blood. The researches of bacteriologists show that the secretions in the lower part of the vagina always contain abundance of microbes, the secretions in the uterus usually none, and those in the upper part of the vagina very few. It will be evident that, if decomposition of the lochia take place, this process will be most advanced in the lochia lying in the lower part of the genital tract. Clinically, it is found that syringing the vagina is, as a rule, enough to keep the secretions healthy; it is but seldom necessary to wash out the uterus.

The diseases which affect wounds of the genital passage received in delivery are the same which affect wounds elsewhere. Certain morbid states of the wounds themselves must be first described.

1. So-called "diphtheritic" ulcers.—An unhealthy condition, in which the wound becomes covered with a whitish or greyish pellicle, whilst the healthy discharge of pus ceases, and is replaced by a slight serous exudation, is known by this name. The surrounding tissues are swollen and reddened, and healing ceases. The pellicle is a superficial slough, and contains abundance of micrococci. Febrile disturbance is always present. It is to be regretted that the adjective "diphtheritic" should have been applied to this and the following condition, for they have no relation to true diphtheria. This disease, before the introduction of antiseptics into midwifery, was quite common in lying-in hospitals, at least in those of Germany, so that this state of laceration of the vaginal orifice has been given the name of "puerperal ulcers." In this country, at least in private practice, it is rare, but the writer has seen it. It ought never to be met with, for it can

be prevented by antiseptic precautions. The *treatment* is to dust the unhealthy surface of the wounds with iodoform, and to syringe the vagina twice daily with a 1 in 2000 solution of corrosive sublimate.

2. Diphtheritic Inflammation.—In some cases the disease reaches a greater degree of severity. There is not merely the greyish pellicle over the wound, and inflammation around, but the ulcer spreads by molecular sloughing of its edges. There is a higher degree of fever and greater prostration. This condition is identical with the disease known as hospital gangrene, or phagedæna. It is scarcely ever seen except in badly managed lying-in hospitals; and as it can be prevented by antiseptics, it ought never to occur.

The *treatment* is to anæsthetize the patient, clean away the slough, wash away all discharges, and freely mop every part of the ulcerated surface with strong nitric acid, and then use vaginal injections of 1 in 2000 corrosive sublimate, twice daily.

3. Spreading Traumatic Gangrene.—This is a still more formidable condition, attended with high fever, and with, at first, redness and swelling round the wound. The redness becomes dusky, then purple, then black, till the tissues are converted into a black pulpy mass, and the gangrene which follows spreads with great rapidity. The decomposition of the gangrenous tissues leads to the evolution of gas, so that there is emphysematous crackling, and, when cut into, gas escapes. The general symptoms are those of septic poisoning with great prostration. This is rare as a puerperal disease, but the writer has known it spread from a tear in the perineum. It is to be prevented by antiseptics. When it has commenced, treatment is hopeless. Sloughing of small tags of tissue killed by the bruising and tearing to which the parts are exposed in parturition, is common, and if antiseptics are used, leads to no harm.

There may be not only the unhealthy state of the wounds of the vaginal orifice which have been described, but similar conditions higher up. The tears of the cervix may show the same appearance as those in the vulva. The inner surface of the uterus is covered by what looks like a diphtheritic false membrane. When this is stripped off, the uterine muscle is found bare, swollen, and presenting points of suppuration; and in section, venous and lymphatic channels are found filled with pus. In

some cases the inner surface of the uterus is converted into a greyish brown sloughing mass. The signs are often especially marked where the broad ligaments leave the uterus.

The inflammation may be found to have spread along the cellular tissue of the broad ligaments, which are swollen, spongy and infiltrated with sero-purulent fluid. In slight cases the poison causing the disease may be stopped by the lymphatics, and then a simple *parametritis* is the result, which may end either in resolution or in suppuration, but remains local (see *PARAMETRITIS*). In other cases there may be rapidly spreading suppuration or even sloughing inflammation, and in these cases the inflammation early extends to the peritoneum. It is to these cases that Virchow applied the term "*erysipelas malignum internum*," and it is this kind of spreading inflammation of the pelvic cellular tissue which is analogous to, and there is reason to think may be produced by, contagion from so-called "*phlegmonous erysipelas*" of skin and cellular tissue. Clinically, these cases are characterized at first by high fever, with slight physical signs, but when the peritoneum becomes affected, the symptoms of *peritonitis* become the conspicuous phenomena. It will be convenient to consider these subsequently.

The inflammation may also spread to the *ovary*, which becomes enlarged, infiltrated with serum or pus, or even converted into a pulpy mass; or, in less severe cases, just as the inflammation may end in production of a circumscribed abscess in the cellular tissue, so an *abscess*, or *abscesses in the ovary*, may be the chief features in the disease.

In slighter cases, the unhealthy condition of the interior of the uterus, may not extend beyond that organ, or lead to general infection, but remain as a *purulent endometritis*. This is especially likely to happen if a portion of the placenta or membrane be retained *in utero*. This endometritis is not itself difficult to cure. Its chief importance is that the inflammation may extend along the Fallopian tube, and cause peritonitis by direct extension; or pus may accumulate in the tube, and late in the lying-in the tube may ulcerate and burst, and the pus escape into the peritoneum. If neither of these events happen the pus may become inspissated, and partly absorbed; the tube is now liable to recurrent attacks of inflammation, by which it becomes greatly thickened, and the patient may be an invalid for months or years.

The conditions that have been described are local diseases, which induce changes in the blood, the local processes being the conspicuous and main features of the disease. There are other diseases in which blood poisoning is the main character, the local changes not being conspicuously different from what is seen in those who go through the lying-in process without grave illness. It is unfortunately the case that the names given to the diseases about to be described have been used by different writers in different ways. The words "*septicæmia*" and "*pyæmia*" have been applied to three different diseases. 1. *Septic intoxication*: also called *septic poisoning*; or, shorter, more distinctive, and therefore better, *sapræmia*. 2. *Septic infection*, or as opposed to *sapræmia*, *septicæmia*, sometimes called *lymphatic septicæmia*. The word "*septicæmia*" has been unfortunately by some writers applied without discrimination to both these diseases. 3. *Pyæmia*. This word, also, has been by some made to include *septicæmia*, that disease being called *pyæmia simplex*. *Pyæmia* has also been called *phlebotic septicæmia*.

1. **Septic Poisoning, Septic Intoxication, or Sapræmia** (σαπρός = putrid).—This disease is produced by infection of the blood, not with poisonous germs, but with poisonous matter produced by the action of organisms, in this case in the lochial discharge. The poison is here a chemical one, the effects of which are proportionate to the dose, and cease when the poison is eliminated; not a living one, which multiplies in the blood. The bacteria which produce putrefaction are not themselves a poison, for it has been shewn that they can be injected into the body without effect. They grow in dead organic fluids, not in the living body, but, by their action on dead matter, they can produce a poison capable of destroying life.

Symptoms.—The symptoms vary with the amount of the poison which has been absorbed, from mere slight fever up to a rapidly fatal illness. The symptoms may begin on the second or third day after delivery, or at any time from this up to the end of the third week. The symptoms are those of fever. The initial symptom may be a rigor, and the temperature may rapidly rise to 104° or higher. The patient feels ill, there is loss of appetite, thirst, dry furred tongue, and headache. There may be delirium, especially at night. Vomiting is common, in bad cases, and there may be diarrhoea.

There is not usually at the outset great prostration, but if the illness go on unrelieved, the symptoms become augmented, the pulse becomes rapid and feeble, the skin sallow and slightly jaundiced; sordes appear about the lips, the patient sinks into stupor, followed by coma, and death occurs. In fatal cases the disease runs a course of at least some days. The lochia may be so foetid that the smell is almost insupportable, both to patient and doctor, but in some cases there is no great alteration in the smell of the lochia. The discharge may be suppressed, or rather retained in the uterus. The decomposed matters irritate the parts with which they are in contact; hence putrid lochia in the uterus set up endometritis, which in its turn augments the amount of secretion, and thus, by furnishing fresh supplies of decomposable matter, aids the continued production of the poison.

The *post-mortem appearances* are the same as those after death from septic infection.

Treatment.—The essential point in treatment is to wash away the poisonous matter which is producing the disease. When this is done, there is rapid improvement, the symptoms sometimes disappearing in a few hours. For the removal of symptoms, it is enough to wash out the uterus with water; but as this does not destroy the germs which cause the decomposition, it is necessary for a permanent effect, to wash out the uterus with an antiseptic solution, the best being a 1 in 2000 solution of corrosive sublimate. One washing out of the uterus with this solution may be enough to cure the patient, but it may need repeating once or twice, on successive days. The best instrument for the purpose is a Neugebauer's tube, made of celluloid. This can be attached to an ordinary Higginson's syringe.

2. **Septicæmia, or Septic Infection**, is produced by the entrance of virulent micro-organisms into the blood. For the entrance of these organisms the smallest breach of surface is sufficient. Hence the liability to this disease has no necessary relation to the extent of the wounds received in parturition, or to the amount of the lochial discharge. The *symptoms* are those of high fever, with great prostration. There is usually a rigor, with rapid rise of temperature and pulse. Slight yellowness of the skin may be present. There may be mental hebetude, with delirium, deepening into stupor. The pulse, as it gets rapid, be-

comes extremely feeble. Often there is dyspnœa. The tongue becomes dry and brown, and the lips covered with sordes; there is often vomiting and diarrhœa. The temperature, high at first, may sink and become subnormal as death approaches. Death usually takes place before the end of the third day.

The *diagnosis* between sapræmia and septicæmia is very difficult, because the symptoms in the early stages are the same, and later, the two diseases are often associated. The conditions which favour the access of one class of germs, favour that of the other also. And some think that under conditions favourable to their growth, the ordinary germs of putrefaction may become, in successive generations, changed into the virulent germs of septicæmia, so that sapræmia may produce septicæmia. Septicæmia can only be distinguished from sapræmia by the greater prostration which accompanies the former disease. In any case of doubt, that is to say, in any case of severe febrile post-partum illness in which there is not present evidence of local disease sufficient to account for the pyrexia, the disease should be treated as one of sapræmia, and the uterus washed out. It must not be forgotten that such washing out may cure the patient, even though no fœtor of the discharges is reported, or can even be perceived on vaginal examination.

The *post-mortem appearances* are those of rapid decomposition with visceral congestion. The surface, a few hours after death, becomes marked with dark lines, corresponding to the superficial veins. The lungs are congested, the spleen is large and soft, the liver and kidneys are congested, the blood is fluid and imperfectly coagulated, the interior of the vessels is stained with blood, from rapid disintegration of the corpuscles. The heart is flabby, and there are ecchymoses in the serous membrane. The blood corpuscles do not run together into rouleaux, but form irregular clumps.

Treatment in septicæmia is hopeless.

3. **Pyæmia, or Phlebitic Septicæmia.**—A disease resulting from the entrance into the circulation of a specific poison developed by the action of micro-organisms in unhealthy or decomposing pus. In most cases of puerperal pyæmia a uterine phlebitis is the source of the pus. It is characterized by two series of phenomena (1) fever of a peculiar type, marked by recurrent rigors, with great and increasing depression. The rigors are sudden and severe; they recur once

in forty-eight or twenty-four hours, or even oftener. During the rigor the temperature rapidly rises to a great height, 105° F. or more, and each attack is followed by profuse and exhausting perspiration, during which the temperature falls. The breath has a sweetish odour which has been compared to that of new-mown hay. The prostration, indicated by increasing muscular weakness, small thready pulse, dry brown tongue, with sordes about the lips, and rapid wasting, increases. An icteric tint of skin (hæmatogenous jaundice) and patches of fugitive erythema are often present.

(2) The formation of secondary or metastatic abscesses. This commences from the sixth to the tenth day, and is the most characteristic feature of pyæmia. These abscesses are marked by their multiplicity, the rapidity of their formation, and the insidious way in which they come on, without being preceded by any sign of disease in the part. They are most common in the lungs and liver, but also occur in the spleen, kidneys, and other parts. Inflammation of the serous membranes is generally secondary to the formation of abscesses. Peritonitis is in puerperal women the most common of these inflammations. The effusion is usually abundant, and rapidly becomes purulent.

Suppurative inflammation of joints is frequent. The joints, often without pain or other sign of local mischief, rapidly become filled with yellowish puriform liquid. Excepting for the effusion, they are usually tolerably healthy, so that if the patient survive the disease, use of the joint is regained. There may also be diffuse abscesses in the limbs, either deep down in, or between, the muscles or superficial, under the skin. Their presence is commonly indicated by patches of cutaneous redness, and a doughy state of the overlying tissues. Suppurative panophthalmitis, dependent on the lodgment of infective emboli in the vessels of the eye, is commoner in puerperal pyæmia than in other forms. There may be retinal hæmorrhages without this destructive disease.

The *prognosis* in pyæmia is very grave. Death usually takes place about the tenth or twelfth day, although some patients linger on for six or seven weeks. Recovery occasionally occurs.

The *treatment* must be conducted on general surgical principles.

4. **Puerperal Peritonitis** is one of the commonest forms of disease included under the term puerperal fever. It may

arise in several ways: (1) as a result of direct injury, laceration, or perforation of the peritoneum; (2) by direct extension of endometritis along the Fallopian tubes; (3) by extension of phlegmonous inflammation of the womb, or of the cellular tissue, to the peritoneum covering it; (4) by the escape into the abdomen of products of inflammation from the Fallopian tube. When occurring in one of the three first mentioned ways, it quickly follows delivery, and soon becomes general. The abdomen is swollen, tympanitic, painful, and tender; respiration is thoracic, vomiting becomes incessant, the pulse hard, quick, and small, the face pinched, the patient lies on her back, with the knees drawn up, unable to move. The prostration rapidly increases, and death takes place from asthenia. After death, the intestines are found distended with gas, the peritoneum injected and covered with puriform lymph; but there is not, as a rule, a large effusion of fluid.

Treatment is, as a rule, hopeless; it consists in the free administration of opium and alcohol.

5. Late Peritonitis.—Cases of peritonitis which arise from the escape of pus from the Fallopian tube into the peritoneum are of much interest, because there is good reason to think that by prompt treatment some at least might be saved. These cases come on later, from the third or fourth day up to the end of the third week, or even later still. The symptoms of peritonitis are, as a rule, preceded by some local pain and tenderness in the region of the affected tube. The pain suddenly becomes acute, sometimes immediately following an unusual exertion, and symptoms of general peritonitis follow.

The *treatment* in such cases (cases of late onset, the general tenderness being preceded by pain in a definite spot) is to open the abdomen, search for the diseased tube, remove it and the other also if diseased, with the ovaries, and wash out and drain the peritoneum. This has not yet been done successfully in a case shortly following parturition; but there is good hope that prompt operation may yet be successful in such cases. An operation, however, could only succeed in cases in which the disease causing the peritonitis was of a purely local kind.

The same principles of treatment apply to peritonitis caused by the bursting of an ovarian abscess, but it has not yet been carried out in such a case.

The diseases which have been described all occur under like conditions—

viz., those which favour the access and growth of micro-organisms. Therefore the different morbid conditions which have been mentioned often occur together. Indeed, cases in which one form of wound disease only is seen quite pure and uncomplicated in the puerperal state are rare. All these diseases are to be prevented in the same way, which will be presently described.

TREATMENT.—The essential treatment after the mischief has occurred has been given under each heading. The treatment otherwise is simply that of fever generally. Strength must be supported by easily digested food. The tendency to asthenia must be combated by alcohol. The nervous system must be sustained with quinine, and opium, if there be pain. If the temperature be very high tepid baths are almost always grateful to the patient, although they do not seem to have much influence on the ultimate issue. If the circumstances do not admit of a bath, tepid sponging, or the wet pack may be used in its place. Antipyretic medicines are of very doubtful value.

Puerperal fever can be prevented by antiseptic precautions. These consist in perfect cleanliness of patient, doctor, nurse, and everything about the patient; that is, an aseptic condition. An aseptic condition can be attained without the use of antiseptic drugs, but without these drugs it is difficult to be *certain* of maintaining it; and therefore the patient is safer if antiseptics are used. In lying-in hospitals the difficulty of preserving everything in an aseptic condition without antiseptics is so great, and the consequences of any lapse from the aseptic condition so terrible, that the use of antiseptics ought never to be omitted.

The first thing that doctor or nurse should do when they enter the lying-in room is to well wash the hands with soap and water, using a nailbrush, and taking care that the nails are made perfectly clean. To make this easy the nails should be kept short. After washing in soap and water, and rinsing away the soap, the hands should be dipped in a 1 : 1000 solution of corrosive sublimate. The nurse should wear a dress of a light coloured material that can be washed, so that every one may see that it is clean. She should wear no rings, other than the plain wedding ring, for in the crevices of fancy rings much dirt may lurk. For lubricating hands, instruments, &c., a solution of corrosive sublimate in glycerin, 1 : 1000, is best. Before any manipu-

lation or operation, hands and instruments should be dipped in a 1 : 1000 sublimate solution. Immediately after the completion of labour the vagina should be syringed with a 1 : 2000 solution of sublimate, and this, should be repeated night and morning for the first three days; after this, until the lochia have ceased, a 1 : 4000 solution should be used. These are the precautions which have been found effective in lying-in hospitals. The objection to them in private practice is that there is some danger of mercurial poisoning. This is likely to happen if the douche be given by an unskilful nurse, in such a manner that the fluid distends the vagina and does not flow out. Therefore sublimate should be prescribed as a douche only when it is certain that it will be used by a competent person. The symptoms of mercurial poisoning, which in some susceptible patients follow the use of sublimate douches even when properly given, are slight, and quickly subside when the mercury is left off. The first symptoms are diarrhoea and slight soreness of the gums. If these occur the use of the douches must be omitted, and the diarrhoea treated by the administration of bismuth, not by opium. On account of the importance of the early recognition of poisoning, sublimate should only be used in private practice so long as the medical man is visiting the patient daily. On the whole, looking at these disadvantages, and at the slight risk of infection in private practice, it is better while using sublimate during the labour, and for the douche immediately after, to use Condyl's fluid $\frac{3}{4}$ ss ad Oj, or carbolic acid 1 : 50, for all ordinary cases during the lying-in; reserving sublimate for cases where some special circumstance, such as difficult delivery, prolonged labour, retained placenta, or exposure to risk of infection seem to indicate special danger.

(6) The old physicians grouped together cases of short and slight febrile attacks occurring in the lying-in period, under the name of *Ephemera*, or *Weed*. Such illnesses are not uncommon, and may arise from various causes. In some cases we find that with rapid elevation of temperature, and other symptoms of fever of a mild type, there is pain and tenderness over the lower abdomen. In such cases, counter-irritation to the abdomen, in the form of a linseed poultice mixed with a quarter of its bulk of mustard or sprinkled with oil of turpentine, combined with the administration

of opium, is often followed by the disappearance of the symptoms within three or four days. In such cases, the inference that there has been *slight peritonitis* best explains the symptoms and the effect of treatment.

Pyrexia of short duration in lying-in women may arise from *emotion*. This kind of fever is recognized by the rapid rise and fall of the temperature. For example, in an hour or two it may reach 104° F., and sink to normal within two or three hours. Excepting the emotional disturbance and the temperature, there are no symptoms or signs of disease.

If the bowels should become so confined that a strong aperient, possibly attended by griping, is needed, irritation from this cause is sufficient in a lying-in woman to produce slight rise of temperature.

The fact that in badly managed lying-in hospitals, febrile attacks of short duration and slight severity are more common than in those in which antiseptics are used, points to the conclusion that many slight illnesses are cases of *slight sepsis*, in which the decomposition is not enough to produce perceptible fetor, and in which the poison is small in quantity, and spontaneously eliminated.

(7) *Milk Fever*.—A febrile disease following delivery was described by the old writers under this name, and was supposed to be due to some disturbance of the system attending the establishment of mammary activity. Accurate thermometric observations made in well-managed lying-in hospitals have shown that, in a healthy lying-in, the establishment of lactation is not accompanied by fever. But if the nipples become sore and inflamed, if the breasts be not properly emptied, and become hard, painful, tender, and distended with milk, fever may arise, but it will subside when the painful condition of the mammae is removed. If not properly treated, a condition such as that described may go on to the formation of a mammary abscess.

The *treatment* for this condition is to apply glyc. boracis to the nipples, if sore: and to empty the breasts with a breast-pump if the child be unable to do it in the natural way. A soda-water bottle, filled with hot water and then emptied, forms an excellent readily procurable and easily applied breast-pump.

(8) *Erythematous Rashes* are not uncommon in lying-in women, and require mention because they sometimes cause alarm. They are not accompanied

by fever, and subside in a day or two without special symptoms.

G. E. HERMAN.

PUERPERAL INSANITY.—This is more common than insanity during pregnancy. That the puerperal state does predispose to insanity, and that the occurrence of insanity within the lying-in period is more than a mere coincidence, is shown by the fact that almost all cases occur within a month after delivery, and the majority within a fortnight. From the fifth to the tenth day is the usual time for the appearance of the symptoms.

Mania.—*Symptoms.*—This is the form of insanity most often met with, especially in the cases which occur in the first fortnight after delivery. The outbreak is often preceded by sleeplessness and refusal of food. The temperature is not raised, unless the insanity be complicated by some condition causing pyrexia, but the pulse is quick. The urine is scanty, and urea, urates, and phosphates are in excess, from the increased waste of the tissues. There is maniacal excitement, with delusions, hallucinations, sleeplessness, possibly filthy habits, obscene talk, sometimes erotic tendencies with masturbation. Patients take food badly, and are constipated.

The *prognosis* is more favourable than in almost any other form of insanity.

The *duration* of puerperal insanity of this form is seldom longer than three months.

Melancholia.—*Symptoms.*—In cases occurring after the first fortnight, this form is more common. It generally comes on more gradually, with mental depression, often with suicidal tendencies, anorexia, constipation, cold clammy hands and feet, and sleeplessness. Insanity beginning as mania may pass into this form.

The *prognosis* in this form, though still good, is not so favourable as in the maniacal cases.

Duration.—Melancholic cases last longer, but most of them are cured within six months, and the large majority within twelve months.

Ætiology.—The conditions which favour the occurrence of insanity in the puerperal state are (1) an inherited tendency to insanity; (2) anæmia, from hæmorrhage during or after labour; (3) depressing emotions, such as attend the death of the child, or illegitimate pregnancy; (4) damage to the brain from

eclamptic seizures; (5) fever in the lying-in period.

The *preventive treatment* consists in making the patient eat and sleep. The removal of pyrexia, followed by the administration of iron and quinine, and easily digestible food, favour the first indication. The sleeplessness, which in the lying-in period so often leads to insanity, is best combated by a dose of alcohol at night—e.g., 6 oz. of port wine, with hot water. Morphine and chloral are to be avoided, on account of the depression they produce. Bromide of potassium may be given if there be much reflex irritability.

The treatment of developed insanity is described under INSANITY.

The INSANITY OF LACTATION may come on at any period during the fulfilment of this function. It occurs in poor and weakly patients, and is usually of the melancholic form.

G. E. HERMAN.

PUERPERAL THROMBOSIS and EMBOLISM.—During the lying-in period the patient is especially liable to thrombosis of the veins of the pelvis and lower extremities. These veins are greatly enlarged during pregnancy; the circulation is unusually slow, the blood contains an excess of fibrin, and thus thrombosis is favoured. Phlegmasia dolens (*q.v.*) is due to thrombosis of venous and lymphatic channels. It is probable that small fragments of clot may be detached from plugged veins, carried into small branches of the pulmonary artery, and there, if not containing septic germs, be absorbed without much harm following. But a clot may be detached large enough to block the pulmonary artery, or one of its main divisions. In that case sudden death will take place. The patient is seized with sudden and intense dyspnœa, and a sense of terror; there is lividity, a rapid and feeble pulse, cold perspiring skin, and the patient may die in a few minutes, perhaps almost instantaneously. The suddenness with which death follows depends upon the extent to which the pulmonary artery is blocked. If a main trunk be not affected, the symptoms will be less severe, and the patient may linger on for some hours, days, or even weeks, dying at length from exhaustion; or it may even be that after a protracted illness slow recovery takes place. The physical signs on the chest in these cases are at first none, and later not well marked. There is some deficiency of ex-

pansion and resonance, and feebleness of the breath sounds over a greater or less area of the chest, and a murmur over the pulmonary artery. Well-observed cases of recovery from pulmonary embolism are too few to admit of generalisation as to their clinical history. In some cases the symptoms seem to be due to thrombosis beginning in the right auricle, and extending into the pulmonary artery, and some think that in the majority of cases the pathological change is of this nature.

Treatment.—The only treatment of use is to keep the patient absolutely at rest, lest any further fragment of clot should be detached, and to obviate the tendency to death by stimulants—alcohol, ether, musk, or ammonia. Warmth to the limbs, and poultices to the chest and epigastrium may give comfort.

G. E. HERMAN.

PULMONARY ARTERY, EMBOLISM and THROMBOSIS OF.

—The pulmonary artery may be blocked by an embolus, or by clotting of the blood in the vessel. Concerning the former process we have more definite evidence than the latter.

Obstruction of the pulmonary artery is apt to occur during the *puerperal state* or *after parturition*, at which times the blood in the venous system is especially liable to undergo coagulation. Post-partum hæmorrhage, placenta prævia and septic conditions of the uterus predispose to coagulation of the blood in the uterine veins; and this coagulation extends into the veins of the pelvis and legs. The femoral and saphena veins are very liable to thrombosis, a condition which gives rise to phlegmasia dolens. In such cases the clot may be detached, and by blocking the pulmonary artery, produce sudden death. Playfair collected twenty-five cases of pulmonary obstruction occasioning sudden death; seven were distinctly of embolic origin, and occurred at a remote period after delivery, in none before the nineteenth day. In fifteen cases there were no post-mortem evidences of embolism; in all these death occurred before the fourteenth day, often upon the second or third. These latter cases he attributed to *primary thrombosis*. If, however, sudden dyspnoea arise, thrombosis can scarcely be supposed to be the cause, unless it be assumed that, after the formation of a clot, the circulation is still carried on, and that the sudden accession of symptoms is due to the occurrence of further

clotting, or to the clot having shifted, so as to completely block the vessel. Pulmonary obstruction from embolism, produced by the detachment of a clot, may also occur from phlebitis in gout or Bright's disease, from thrombosis of the cerebral sinuses, or of the veins of the limbs in exhausting diseases.

Rare instances have occurred of blocking of the pulmonary artery by hydatid cysts, and by the detachment of cancerous masses which have grown through the wall of a large vein.

Cardiac Thrombosis, secondary to blocking of the pulmonary artery, is less liable to lead to sudden death than when the clot is detached from a vein; because before the clot is detached it nearly always undergoes softening and disintegration, and the débris which is discharged into the pulmonary circulation causes embolism of the middle-sized and small arterial branches, producing pulmonary infarction and its attendant symptoms; It is especially liable to occur in mitral disease, particularly mitral stenosis. In leucocythæmia a clot may be detached from the right heart of sufficient size to block the pulmonary artery, or one or more of its main branches, causing sudden death. A mere mention will suffice of the fact that in many cases in the death agony, or during the last few hours of life, a clot forms in the right ventricle which extends into the pulmonary artery and its branches.

Symptoms.—These may be divided into classes according to the size of the vessel obstructed. If the pulmonary artery itself, or one or more of its larger branches be blocked, then a train of symptoms will arise which will probably be of such short duration that death will frequently occur before the physician can be called. There will be sudden *dyspnoea*, pain in the chest with anxiety of impending death, the jugular veins may be distended, the lips blue, the skin cold and clammy, the pulse weak and thread-like, the heart's action tumultuous and irregular, or so feeble that the impulse cannot be felt. Auscultation shows that air is entering the chest freely, but the blood, being unable to reach it, the respiratory efforts are without avail. In some cases where an embolus is situated in the pulmonary artery or one of its branches, but has not completely filled it, a systolic murmur can be heard over the vessel so affected. Towards the end, which may occur within a few minutes, convulsions and unconsciousness may come on; the

patient dies, in such a case, of *asphyxia*. A number of cases, however, die of *cardiac syncope*, owing to paralysis of the heart from distension of the right cavities, the left being empty and contracted. In such cases the skin is pale, and the end sudden, often being undistinguishable from angina pectoris, rupture of an aneurysm, or of the heart itself into the pericardial cavity. The case may, however, not terminate fatally, for the clot may be driven further along the vessel and allow some portions of the pulmonary circulation to receive blood, and the patient may recover, or after hours or days another accession of symptoms may arise, terminating fatally.

Symptoms of obstruction of middle-sized branches of the pulmonary artery are dyspnoea, and blood-stained expectoration, the sputum consisting almost entirely of dark blood, or of blood mixed with more or less mucus, but there is never much air in it. This characteristic expectoration lasts for several days. A large peripheral infarction may give rise to dullness on percussion, crackling râles and harsh or bronchial respiration, and sometimes pleuritic friction. When small branches of the pulmonary artery are blocked, causing small infarctions, there may be absence of sudden dyspnoea and oppression, although on account of an attendant pleurisy the patient may complain of pain.

Diagnosis.—If one of the causes enumerated be present in association with the sudden supervention of the symptoms described, particularly if the patient be a woman who has not long been delivered, or if there be evidence of venous or cardiac thrombosis, a diagnosis may be made, but it is often attended with difficulty.

Prognosis.—When the artery or one of its large branches are blocked, the prognosis is always very grave, but if the case be not suddenly fatal, there must still be circulation going on in some part of the pulmonary system, therefore a chance of recovery exists, but it must be borne in mind that a further obstruction may occur by an addition to the clot. Some undoubtedly severe cases have, however, recovered. The occurrence in heart disease of embolism followed by hæmorrhagic infarction is, on the whole, unfavourable, since it points to weakness of the right ventricle, and hence to the formation of a thrombus in it, yet frequently the symptoms of a pulmonary infarction pass away entirely.

Treatment.—*Prophylactic.*—The acci-

dent can often be prevented by care. A patient suffering from any of the conditions which may give rise to embolism of the pulmonary artery or its branches should not be allowed to make any exertion, or to get out of bed or strain at stool, lest the clot be detached.

Therapeutic.—Very little can be done. Stimulants, such as ether, ammonia or brandy or a hypodermic injection of ether may be given in order to keep the patient alive. Leeches, dry cupping and sinapisms over the cardiac region, and perhaps bleeding from the arm might do good to relieve the distension of the right heart. If the case be not suddenly fatal, and oxygen can be obtained, its inhalation might be tried. Absolute rest should be enjoined, even after alarming symptoms have passed away, for any exertion may lead to a renewal of dyspnoea and cardiac embarrassment.

F. W. MOTT.

PULSE.—What is known as the pulse is not a distension of the artery by the blood which is being driven through it, but a change in the shape of the artery, due to a temporary increase in the tension of its walls.

Dr. Broadbent, to whose teaching on this subject the writer is greatly indebted, has shown that the pulse is felt in the normal condition only when an artery is somewhat compressed and flattened against a bone or other hard substance. With each beat of the heart the fluid pressure in the whole of the arterial system is increased, and consequently the compressed vessel tends to resume its former cylindrical form; it is this change of form which is felt as the pulse. The pulse can be felt wherever an artery lies near the surface and can be compressed against a bone beneath it, and for practical purposes the radial artery at the wrist is always chosen. The pulse may be examined by either the finger or the sphygmograph. Very rarely does the latter instrument convey more, or even as much, information as the educated finger, yet its tracings are useful as records of the pulse at various times (see SPHYGMOGRAPH). In this article, while the indications of the sphygmograph will be referred to occasionally, the descriptions of the pulse will be based upon an examination with the finger alone.

Examination of the Pulse.—The method to be pursued in examining the pulse is the following:—The first three fingers are laid lightly upon the radial

artery at the wrist and are then carried transversely to and fro across the artery. Thus, its size is appreciated and the degree of fullness between the beats of the pulse. Next, the fingers should carry the skin along the artery, using varying degrees of pressure. In this way a tortuosity of the vessel and an irregular thickening of its walls from atheroma will be detected, and when the vessel is completely emptied by pressure its walls may perchance be found uniformly thickened so as to form a cord beneath the finger. Now, pressing upon the artery with the finger, or the two fingers, nearest the heart and using moderate force, the pulse itself will be perceived. The characters of the pulse to which the observer's attention should be directed are :—

1. *The Frequency.*—This is an indication of the frequency of the heart beat, but may or may not correspond with the latter.

2. *The Size.*—That is the degree in which each heart-beat diminishes the flattening of the artery by the finger. The force of the heart-beat being the same, the size of the pulse will be greater when the arteries are relaxed and easily flattened, less when they are contracted or distended, and, therefore, not readily compressible. Moreover, in the latter condition, the size of the pulse will be found to increase as greater pressure is applied to the artery.

3. *The Uniformity.*—The beats should be regular in rhythm and equal in size.

4. In each individual beat there must be noticed the *sharpness* with which the beat strikes the finger, the *duration* of the beat and its *mode of decline*, whether gradual or sudden.

5. *The Strength.*—This cannot be estimated from the size of the pulse, since the latter will vary with the degree of relaxation or contraction of the artery; it must be judged by the amount of pressure required to obliterate the pulse. Pressure should be applied by the finger, or two fingers, nearest the heart until by the third finger the pulsation is found to have disappeared. The degree of pressure necessary will serve as a guide to the force of the heart beat.

6. *The Bilateral Similarity.*—It is desirable in certain cases to examine the pulse at each wrist, and, bearing in mind a possible abnormal distribution of the arteries, to note any differences there may exist in the characters of the two pulses, or any want of synchronism.

Recurrent Pulsation.—This phenomenon introduces a fallacy to which the

careless observer is liable. In certain conditions, even though the circulation through the radial artery towards the periphery be completely interrupted by the observer's fingers, there is still felt a slight and somewhat delayed pulsation in the artery. This is due to a transmission of pulsation through the palmar arch, and it occurs when the vessels are relaxed. It is associated with two conditions, namely, such a low tension pulse as occurs in aortic regurgitation, and the condition which is met with at the end of a case of chronic Bright's disease, when peripheral resistance to the circulation remains, but the arteries have ceased to contract upon the blood.

Abnormalities of the pulse involving all these points will now be briefly described.

Excessive Rapidity of the Pulse; Tachycardia.—The normal rate of the pulse is about 72 beats per minute, but this is easily varied by many physiological conditions, such as food, exercise, excitement, the upright position, &c. There are many pathological conditions which accelerate the pulse. Pyrexia from any cause, but especially that which accompanies scarlet fever, is perhaps the most frequent. States of anæmia and debility are notable, not only for general rapidity of the pulse, but also for the ease with which the physiological conditions mentioned above increase the average pulse rate. In Graves' disease, the symptom most constantly present is increase of the frequency of the pulse, together with a sense of palpitation of the heart. Many nervous disorders, and among these may be mentioned locomotor ataxy, are accompanied by persistent frequency of the pulse, and the same symptom is noticed as an early sign of cardiac failure from any cause.

There exists a strange group of cases in which rapidity of the pulse is almost the only symptom observed. This condition is not infrequent as a paroxysmal occurrence in gouty or mentally over-worked subjects. It comes on suddenly after slight exertion, or excitement, and is accompanied by a great sense of oppression and of impending danger. This form of so-called tachycardia, generally passes off after a period of rest in the supine position. But in another class of cases the extreme frequency of the pulse may remain for a considerable time as a constant symptom, and may reach such a degree as to cause the heart to beat more than 300 times in the minute. This tachycardia comes on suddenly, and

often without apparent cause. There is rarely any feeling of distress in the early stages, and nothing to account for the condition can be discovered by stethoscopic examination. In severe cases, the face becomes pale or cyanotic, and signs of œdema of the lungs and general failure of the circulation may be detected. The cause is doubtless some disorder of the nervous mechanism of the heart. It is not a safe condition, for sudden death has been known to occur in a number of cases. In one such case, the writer was able to detect after death nothing more than an enlargement of the heart and some degeneration of its fibres, which were more likely to be the result than the cause of its rapid action. The cardiac nerves were structurally normal. Rest, and freedom from excitement should be enjoined in such cases, and drugs which steady the heart such as digitalis, convallaria and strophanthus should be prescribed. Yet all these remedies, while useful for a time, seem powerless to effect a cure, which may, however, occur spontaneously.

Slow Pulse, or Bradycardia, may be habitual to some persons and not indicative of a departure from health. Again, it is produced by jaundice, and is found sometimes as a symptom of fatty degeneration of the heart. It must not be confused with that condition known as *dropped beat*, in which each alternate beat of the heart fails to reach the pulse. As Dr. Broadbent has shown, this is due to the second contraction of the left ventricle being too weak to raise the aortic valves, the right ventricle at the same time acting normally. An extremely slow pulse may be associated with epileptic seizures, because the slowly acting heart is incapable of supplying a sufficient amount of blood to the brain.

Intermittent and Irregular Pulse.—The pulse may vary its rhythm in relation to the heart's action or independently of this. An intermittence in the pulse may therefore be dependent on an intermission in the cardiac action, and it may be regular or irregular in its occurrence. Such a condition is habitual to some persons, is very common in gouty subjects, and is readily produced by dyspepsia, nervous excitement, and abuse of tea and tobacco. On the other hand, intermission of the pulse may be merely a form of the dropped beat just described. An irregular pulse is one in which the rhythm and possibly the force of the pulse-beats varies irregularly.

It is especially associated with cardiac failure and with mitral regurgitation. Varieties of the intermittent and irregular pulses are the so-called *pulsus bigeminus*, *pulsus trigeminus*, and *pulsus paradoxus*.

The **Pulsus Bigeminus** receives its name from the fact that the beats of the pulse occur in pairs, each pair followed by a somewhat longer interval than usual. The first beat of the pair is a normal one; the second is often much weaker than its predecessor. The heart beats correspond in rhythm, and Dr. Broadbent has observed that a mitral murmur, heard with the first beat, may be inaudible with the second, and that a tricuspid murmur may be heard only with the second beat. This pulse is common in mitral stenosis.

In the **Pulsus Trigeminus** the associated beats are three in number.

Pulsus Paradoxus is the name given to that condition in which the pulse-beat is lost or becomes much weaker, during each inspiration. It is found in association with weak heart, with adherent pericardium, and with chronic mediastinitis, where fibrous bands surround the roots of the large vessels, and also bind the pericardium to the sternum. Its ætiology in the latter case would seem to be evident, for with each inspiration the fibrous bands would be dragged upon, and thus the entry of blood into the large vessels from the ventricles would be hindered. Another mechanism, however, is possible, and may well obtain in those cases where no such adhesions are found. With each inspiration the negative pressure on the thorax is increased, and may thus offer more resistance to the emptying of the ventricles than a weak heart, or one acting under conditions otherwise unfavourable, is able to overcome.

High Tension Pulse.—The tension of the arterial walls is increased at each systole of the ventricles and causes the pulse. But the mean tension of the arteries is capable of variation under many conditions. The mean tension depends upon the force of the ventricular systole, and the amount of resistance which the blood experiences in passing through the capillaries; variations in either of these two factors will cause corresponding changes in the character of the pulse. A normal pulse is, as a rule, easily compressible, and the artery can scarcely, if at all, be felt between the beats. Increase of the peripheral resistance, together with a corresponding increase in the force of the ventricular

systole, produces the high tension pulse, the characters of which are, that it is gradual in its impulse, long in duration, slow in subsiding, with difficulty compressible and the artery is felt between the beats as a firm round cord. Usually the artery is small, and the pulsation may appear to be small and weak, until considerable pressure is applied to the artery, when the beat is found to be really very forcible. The sphygmographic tracing is characterized by a short sloping upstroke, the absence of percussion waves, a rounded or lengthened summit, and a gradual descent, in which the dicrotic wave is very slightly marked, and the dicrotic notch is high above the base line.

Virtual Tension Pulse.—If with the peripheral resistance still continuing, the heart power should fail, the pulse of high tension becomes one of, what Dr. Broadbent has named, "Virtual Tension." In this variety the artery is still full between the beats, but is generally large; the impulse is sudden, lasts but a short time, and suddenly declines. The sphygmographic tracing shows a moderately high and perpendicular upstroke, very often percussion waves, and a somewhat gradual descent, in which the dicrotic wave is well marked, but the dicrotic notch is high above the base line.

Some degree of high arterial tension is often a natural condition with individuals, and not infrequently many members of a family may show it without any symptoms of, or inclination to, disease, being detectable. As a rule, however, a high arterial tension indicates an impure state of the blood, which renders it incapable of passing easily through the capillaries, and which is induced by abuse of nitrogenous food, habitual alcoholic excesses, constipation, and deficiency of exercise. It is especially found in association with Bright's disease, gout, lead poisoning, and pregnancy. Dr. Broadbent has observed that the pulse of scarlet fever differs from that of the other eruptive fevers, in that it shows high instead of low arterial tension. Some cases of anæmia present a persistently high arterial tension, and it must be noted that neurotic subjects, under the influence of excitement or worry, will develop a great increase of the arterial tension, which sometimes comes on very suddenly and as suddenly declines; this is clearly not due to an impurity of the blood, but doubtless to contraction of the arterioles.

The pulse of virtual tension is met

with in similar conditions when the heart begins to fail. It is hence most often found in the late stages of Bright's disease.

Space will not allow of a description of the evils brought about by high arterial tension. It must suffice to say that they result on the one hand from the strain upon the heart and blood-vessels, and on the other from the failure of nutrition of all parts of the body, but especially of the nervous system, which is induced by the deficient circulation. High arterial tension is best combated by a due regulation of the habits of life and a limitation of alcohol and of nitrogenous food. Salines should be given, the bowels kept freely open, and mercurial purges occasionally administered. The pulse of virtual tension is, as has already been stated, a sign of heart failure, and calls for treatment based upon this view.

Low Tension Pulse.—The pulse of low arterial tension is sudden in its onset, short, and quickly declines. The artery is scarcely to be felt at all between the beats, and the pulse is easily obliterated by pressure. The size of the pulse will depend entirely upon the force with which the heart is acting, being large when the systole is strong and *vice versa*.

Dicrotic Pulse.—This is observed when the arterial tension is low. On applying the fingers very lightly to the artery a second impulse can be readily detected following the first. The second shock is due to the rebound of the elastic arterial walls, after the systole of the ventricle has stretched them, the closed aortic valves acting as a fulcrum. It must be carefully distinguished from the pulsus bisferiens, or pulsus triferiens observed sometimes in aortic stenosis, which are due to the reinforcement of a prolonged ventricular systole near its close, by one or two accessory spasmodic contractions. The terms hyperdicrotic and anacrotic are used to distinguish degrees of dicrotism, which are shown by the sphygmograph. They are of no practical importance. The sphygmogram of low arterial tension shows an abrupt ascent, varying in length according to the force of the heart beat, a sharp summit, and an abrupt descent, in which the dicrotic wave is well-marked and the dicrotic notch is placed near the base line.

Low arterial tension indicates a deficient power in the circulation. Its most frequent cause is pyrexia, and it is found

generally in states of debility. It calls for the administration of tonic remedies.

The Collapsing Pulse of Corrigan, found in aortic regurgitation, is a special form of the low tension pulse. It is very sudden in its impulse, large, of short duration, subsides with great abruptness, and between the beats the artery is scarcely to be felt. The size of the pulse is due to the dilatation and hypertrophy of the left ventricle, which, for the purpose of compensation, always accompanies aortic regurgitation. The non-closure of the aortic orifice during the diastole of the ventricle, allows part of the blood driven into the artery to flow out again. Thus, while the great increase of tension due to the systole of the hypertrophied ventricle is felt in its full force, yet immediately the systole is over, the artery is no longer kept distended, but "collapses." At the same time, a distinct delay can be perceived before the systole, as timed by the apex beat, produces its effect on the radial artery. In this condition, too, the blood which flowed out of the artery during the ventricular diastole is projected into the more or less emptied vessel at the next systole, and this re-filling of the artery causes the "visible pulse." The mechanism of such a pulse is thus quite different to that of the normal pulse, as felt by the fingers, which, as has been stated, is not due to progression of blood through the artery, but to increase of tension of its walls. Again, the shock of the ventricular systole, and the return of the blood to the relaxed and partially emptied arteries, causes them to move in their beds and exaggerates their curves, producing the vermicular appearance known as the "locomotive" pulse. All the features of the collapsing pulse are more marked when the arm is raised above the head. The sphygmogram shows a very high and abrupt ascent, the presence of percussion waves, a sudden descent, and a very faint and low diastolic wave.

Capillary Pulsation is a phenomenon seen in connection with very relaxed states of the arteries, and especially with aortic regurgitation. If a capillary blush be raised by scratching the forehead, its edges will be seen to pulsate distinctly with each beat of the heart. The same pulsation may be seen under similar circumstances at the edge of redness under the finger-nail, when the tip is pressed firmly.

Venous Pulse.—Dr. Broadbent has shown that in the same conditions the pulsation may be communicated even to

the veins, and can be well seen in the veins of the wrist when the hand hangs down. Pulsation also occurs in the veins of the neck, in tricuspid regurgitation, where the systolic shock of the right ventricle is communicated to the contents of the right auricle and through them to the superior vena cava and its radicles.

Aneurysmal Pulse.—An aneurysm of the thoracic aorta or of one of its large trunks may modify the radial pulse in a characteristic manner. The artery is then full between the beats, and the pulse itself is small, but becomes somewhat more evident when pressure upon the artery is increased. The impulse is not sudden, is long in duration, and subsides gradually. These points become more marked when only one radial pulse is affected by the aneurysm and comparison can be made with its normal fellow. It will then be found that the affected pulse is considerably delayed behind the healthy one.

The characteristics of the aneurysmal pulse are much more evident in the sphygmographic tracing than to the unaided finger, and can be discovered by the instrument at an earlier stage. The sphygmogram shows a low and gradual ascent, a rounded summit, a gradual descent, and almost entire obliteration of the secondary waves. Such a tracing may be imitated almost exactly by aortic stenosis, but is distinguished by this point—that considerable pressure is required with the screw of the sphygmograph to bring out the characters of the aneurysmal tracing, but is not required for that of aortic stenosis.

The cause of this modification of the pulse, when present in its typical form, is the interposition of the aneurysm as an elastic reservoir between the heart and the radial artery. The shock of the systole and also of the diastolic wave is received by the aneurysm, and only gradually distributed to the peripheral parts, while the radial artery is kept constantly full as if by the elastic reservoir of a Higginson's syringe. The position of the aneurysm will determine whether one or both radial pulses will be affected by it. If it affect the ascending arch only, both pulses may be altered, and, consequently, comparison between those of the two sides is useless. Here the sphygmograph will often be found a great help. If the aneurysm involve the innominate artery, the right radial pulse will exhibit the aneurysmal character, and not the left; and, again, the right

pulse may be behind the left in time. When the aneurysm is situated beyond the origin of the innominate artery, the right radial pulse will be normal, the left aneurysmal. If it be beyond the origin of the left subclavian artery, of course neither radial pulse will be affected. Moreover, a comparison of the radial with the carotid pulse of the same side will sometimes reveal that the aneurysm has involved the subclavian artery and left the carotid intact, and will show, too, that the aneurysm is not situated on the proximal side of the carotid.

The above remarks refer to typical cases, but the conditions are liable to be complicated. Thus the filling of an aneurysm with fibrin will, to a great extent, hinder its action as a reservoir, and so prevent its influencing the pulse. The writer thinks, too, that considerable narrowing of the neck of the aneurysm will have the same result. Again, the aneurysm may press upon the subclavian artery or cause the orifice of that artery to be greatly narrowed when it arises directly from the sac. Both these latter conditions will produce a radial pulse very like the true aneurysmal pulse, but the writer would recommend in such cases a reference to the degree of pressure required to bring out the characters of the sphygmogram. He has reason to believe that in such cases the best tracing will be obtained with a much lower pressure than is the case with the true aneurysmal tracing. In one instance he was by this means led to a correct diagnosis of embolic narrowing of the subclavian artery rather than of aneurysm of the aorta when the differences of the radial pulses suggested the latter condition. Finally, the subclavian artery may be entirely obliterated by an aneurysm, and then the pulse in the radial artery is wanting. (*See also SPHYGMOGRAPH.*)

ROBERT MAGUIRE.

PUPIL, DISORDERS OF.—The aperture in the iris, whereby rays of light are admitted to the percipient parts of the eyeball, is usually circular and situated a little to the nasal side of the middle of the cornea. The muscular portion of the iris is generally considered to consist of central circular fibres for the contraction of the pupil, and of peripheral radiating fibres having an opposing action. The centre for the regulation of the former is situated in the anterior part of the nucleus of the third nerve, behind the centre for accommodation, the connecting motor path being formed

by the second fasciculus of origin of the third nerve (probably), its trunk, the lenticular ganglion and the ciliary nerves. The centre for the dilator fibres probably lies below the corpora quadrigemina, from which the motor path extends down the cervical portion of the spinal cord, thence by the rami communicantes of the first or probably the second dorsal nerve to the sympathetic. The pupil is affected by disease implicating any part of these tracts.

Mode of Examination.—The pupils should be examined as to (1) equality, (2) size in ordinary light, (3) mobility, and (4) shape. To detect any inequality, care must be taken that the same amount of light falls in each eye. Their size may be estimated by comparison with a series of dots, ranging in size from 1–10 mm. in diameter, held alongside the eye.

Normally, on shading one eye and allowing a bright light to fall suddenly upon the other, the pupil is seen to contract (direct reflex action). The shaded pupil also contracts, coincidentally, but to a less degree (indirect reflex action). The pupils should dilate in the shade and also upon the application of some cutaneous irritation, such as the faradic wire brush applied to the neck; in some, this happens when one of the extremities is pinched.

The pupils have also an associated action with the ciliary muscle, so that during relaxation of accommodation, as in looking into distance, they dilate, but contract concurrently with increasing accommodation.

Variations from the Normal.—1. It is extremely rare for marked inequality of pupils to exist apart from disease or great difference in the refraction of the two eyes. In some cases one pupil, though at times equal to the other, is liable to undergo dilatation, and with it the accommodation is proportionally weakened. Such a condition is generally associated with neuralgia, and seems to depend upon want of tone of the corresponding part of the nucleus of the third nerve. In general paralysis of the insane inequality of pupils is usually present, but varies considerably during the course of the disease and also from day to day. In peripheral neuritis, especially of alcoholic origin, the pupils are often unequal. Irritation of the sympathetic causes a dilatation of the corresponding pupil; paralysis of the same nerve, a slight contraction, so that in a moderate light the affected pupil is rather smaller than the other.

Paralysis of the circular fibres of the pupil causes a moderate dilatation. The pupil of a blind eye soon becomes rather larger than the other.

2. The pupils are commonly large (mydriasis) after the administration of large doses of belladonna, in anæmia, syncope, aortic incompetence, bilateral paralysis of the third nerve, during great pain, and also in the convalescence from typhoid fever, in which case such dilatation sometimes occurs that the red fundus can be seen. The local application of atropine, daturine or cocaine, causes a dilatation far exceeding that which is produced by paralysis of the third nerve. Contraction of the pupil (myosis) is found in the course of typhus fever, tabes dorsalis, sleep and photophobia. It also results from the local application of eserine, and of large doses of opium internally.

3. Affections of mobility are common and of great importance. One of the earliest signs of tabes dorsalis, is the so-called Argyll-Robertson pupil, which consists of the loss of the light reflex, with the retention of the associated movement. In many of these cases, the pupils are uninfluenced by cutaneous irritation. The Argyll-Robertson pupil is also present in some cases of general paralysis and of old-standing syphilis. If both eyes be equally shaded in one-sided paralysis of the sympathetic, it will be seen that the affected pupil does not dilate, and hence appears much smaller than the normally dilated one. In those rare cases of paralysis of the circular fibres alone, the moderately dilated pupil is unaffected by the brightest light. When paralysis of both sphincter and dilator occurs (iridoplegia), the pupils are altogether uninfluenced by light, but retain their associated action, except in very old standing cases. In amaurotic eyes the direct light reflex is lost, but the indirect is increased. This is in marked contrast with what occurs in hysterical blindness, in which the light reflex, both direct and indirect, is quite normal. In some conditions these reactions to light and accommodation are mechanically prevented, as in glaucoma, by thinning of the iris and pushing forwards of the lens; serous iritis; excluded pupil, due to the gumming of the edge of the iris to the lens; and occluded pupil, in which the iris is adherent to a false membrane, occupying the area of the pupil. *Hippus* is a very rare condition in which the pupil contracts and dilates without obvious cause.

4. The most marked changes in the shape of the pupil are found in iritis, and are especially evident after the instillation of atropine, which dilates only those parts not bound down by adhesions. Sometimes shreds and filaments are seen, of the same colour as the iris and attached to the anterior surface close to its pupillary border. These are persistent remains of the pupillary membrane. In some cases of tabes dorsalis the pupils are of irregular shape, and in glaucoma they are often vertically oval. Sometimes there is a congenital cleft in the iris, usually symmetrical and always in a downward or down and inward direction.

WM. GAY.

PURGATIVES are substances which act on the bowels, causing increased evacuations. This they do either by increasing the peristaltic action, or by increasing the secretion from the intestinal glands. The former is the mode of action of the *simple aperients* or *laxatives*, the largest class, to which belong rhubarb, senna, aloes, castor oil, sulphur, magnesia, belladonna, and certain fruits such as figs, tamarinds, rhamnus frangula, cascara sagrada, &c. The other class, viz., those which cause increased glandular action or *drastics*, includes elaterium, croton oil, gamboge, and colocynth. Between these, however, are certain groups of substances which act in both ways; of such the *hydragogues* or *cathartics* act on the glandular secretion—they are mercurials, scammony, and jalap; the *salines* increase secretion whilst also promoting peristalsis—such are the sulphate of magnesia and the salts of potash and soda. One other class of purgatives remains to be mentioned, viz., *cholagogues*, so called because they promote the expulsion of bile from the body: this they do in two ways, either by stimulating the liver to an increased formation of bile—the direct cholagogues, of which the chief are sulphate of soda, nitro-hydrochloric acid, dandelion, jalap, rhubarb, aloes, colocynth, euonymin, and iridin—or they act indirectly by stimulating the intestinal glands, especially those in the duodenum, hurrying on the bile, and preventing the reabsorption which normally occurs in that part of the intestine. The mercurial preparations are the best indirect cholagogues.

Apart from constipation there are three conditions especially in which the administration of purgatives is indicated, viz., (1) at the commencement of an acute illness, when a blue pill, a dose of

calomel or colocynth may be given with benefit; (2) in general or partial dropsy, whether from heart, liver, or renal disease; in this class of cases the hydragogues are especially useful, jalap in the form of the pulvis jalapæ co. being the favourite remedy; where a more powerful action is desired a pill of elaterium may be employed; (3) in cases of cerebral hæmorrhage where a speedy reduction of the blood pressure is called for, a drastic is indicated, of which croton oil is the most efficient and speedy in its action; one or two drops may be placed on the tongue.

As a general rule, where a single purgative dose is indicated, the remedy should be given at bedtime and followed in the morning with a saline draught—*e.g.*, Carlsbad salts or seidlitz powder. In cases of dropsy where the purgative has to be administered repeatedly, it is better to give it early in the morning, before any food is taken.

PURPURA.—A comprehensive term which includes all extravasations of blood into the skin and mucous membranes, not resulting from traumatism. Thus understood, it is symptomatic of very various conditions, and may depend upon a multiplicity of causes, several of which may co-exist in a given case.

Symptomatic Purpura may be (1) mechanical, due to increased blood pressure; either permanent, as in chronic pulmonary or cardiac ailments, or temporary, as in paroxysmal affections (pertussis, epilepsy). The tendency to hæmorrhage is greatest in dependent parts owing to gravitation, and in lax tissues where the vessels are badly supported (*e.g.*, the eyelids).

(2) Dependent on changes in the blood or walls of the blood-vessels, as in anæmia, leucocythæmia, hæmophilia, Hodgkin's disease, sarcomatosis, scurvy, rickets, ague, jaundice, Bright's disease, rheumatism; or in lardaceous disease, chronic alcoholism, and old age. Purpura occurring in children immediately after birth is referred to the circulatory changes which then take place.

(3) Toxic, as in snake poisoning, and from the administration of various drugs—iodides, bromides, phosphorus, mercury, quinine, salicylic acid, chloral, ergot, belladonna, copaiva.

(4) Due to disordered innervation of the blood vessels, resulting in nutritive changes in their walls, or in their irregular contraction and consequent excessive strain at certain points. Such are the

hæmorrhages which occur in hysteria, after neuralgiæ, in tabes dorsalis, and many other diseases of the spinal cord and brain.

(5) The result of a specific infective virus—*e.g.*, in all the acute specific fevers, syphilis, tuberculosis, malignant endocarditis, and septicæmia.

(6) Cases which cannot be considered as belonging to any of the foregoing types, may be grouped together as idiopathic purpura, although recent researches tend to establish their close connection, if not absolute identity, with the last-mentioned form.

Purpura simplex represents its mildest degree. It generally occurs suddenly in persons who are apparently healthy, and especially in the young. Roundish or irregularly shaped petechiæ appear, of a deep red colour which does not disappear on pressure and soon becomes purplish, not raised above the surrounding skin, and usually remaining discrete. There are no concomitant, constitutional, or subjective symptoms. In children they are commonest about the upper part of the trunk, neck, and arms; in adults, about the inner surface of the thighs, but they may affect any part of the body, and are generally symmetrical. Fresh crops may continue to appear for weeks, each spot as it fades becoming successively blueish, greenish, yellowish and brownish.

The condition is apt to be mistaken for flea-bites.

Purpura Hæmorrhagica (*Morbus Maculosus Werlhofii; Land Scurvy*).—A greatly aggravated form of purpura simplex. Although common in weakly and anæmic persons—especially in girls about puberty—with bad hygienic surroundings, it is of comparatively frequent occurrence in the apparently robust of either sex and of any age, without appreciable cause. A severe case is usually preceded by marked general malaise, fever, headache, pains in the limbs and abdomen, and vomiting. Then hæmorrhagic points, larger than in purpura simplex, appear upon the lower limbs, soon to extend in successive crops over the whole body surface, coalescing to form irregularly shaped, extensive ecchymotic patches, or even raised bloody tumours (ecchymomata). Hæmorrhages from mucous surfaces, often alarming in amount, occur with special frequency from the nostrils, mouth, stomach, intestine and kidneys, the patient becoming greatly reduced thereby. Hæmorrhagic effusion also takes place into the

serous cavities, and sudden death may result from bleeding into the ventricles or upon the surface of the brain. Throughout the case there is generally some elevation of temperature, sometimes of marked septicæmic type, but no constant relation has hitherto been established between the severity of the pyrexia and of the general symptoms.

In considering the *differential diagnosis* from the various forms of symptomatic purpura, it is of the greatest practical importance to eliminate scurvy.

Recovery is the rule, and, in cases of average intensity, usually takes place in about four weeks. A favourable termination sometimes ensues in apparently desperate cases after several weeks' duration, but, on the other hand, death often occurs.

Pathology.—In a few recent cases, plugging of the capillaries with colonies of bacilli containing spores, or with streptococci, has been demonstrated. As the result, extravasation occurs into the corium or its papillary layer, whence it may penetrate the deeper layers of the epidermis; the serum is absorbed, and the subsequent changes in colour are due to alterations in the hæmatin, the ultimate term being hæmatoidin. In mucous membranes, breaches of continuity—hæmorrhagic erosions—rapidly form.

Treatment.—No treatment may be called for in the mildest cases. In severe cases, absolute rest in bed is imperative. The diet ought to be liberal and stimulating, generous wines, strong soups, and meat essences or jellies being useful. If scurvy be even suspected, fresh green vegetables, mealy potatoes, and lemons may be given with advantage. The bowels ought to be acted upon by mild saline laxatives, if there be any tendency to constipation. Iced drinks, iced enemata, and ice locally are often indicated. Turpentine, ergot, hamamelis, acetate of lead, perchloride of iron, the mineral acids, and chlorate of potash are the drugs usually employed, and all are occasionally of service. Arsenic has been strongly recommended by some authorities.

For Purpura Rheumatica *see* PELIOSIS.
J. J. PRINGLE.

PUSTULE, MALIGNANT.
(ANTHRAX; Woolsorter's Disease; Splenic Fever; Carbuncle; Charbon).—An acute disease, due to the absorption of a specific virus, the bacillus anthracis; sporadic among human beings, frequently epizootic and enzootic

among sheep, cattle, and some other animals.

The term Woolsorter's Disease, now in common use, is derived from the fact of the disease prevailing among the sorters of certain kinds of wool, who are numerous in Bradford. "Sorting" means dividing the wool into "sorts," according to quality. To Dr. J. H. Bell of Bradford is due the credit of having established the identity of the "Woolsorter's Disease."

MALIGNANT PUSTULE.—This term is applied specially to that form of anthrax in man, in which the virus has entered the body by a cutaneous wound, the point of inoculation becoming the site of a peculiar and characteristic sore. Nothing similar to this local sore occurs in animals, whether suffering from a spontaneous attack or from an experimental inoculation. The actual breach of surface may be very small, as observed among woolsorters in Bradford it is often not larger than a split pea, but the tumour may be as large as an apple, or larger.

Symptoms.—Sometimes the patient feels a distinct tingling or slight "pricking" pain at the time of inoculation, but it is never sufficient to attract more than momentary attention. The face, neck, hands, and arms are the most usual situations of the malignant pustule, being the most exposed parts.

In the course of some hours a pimple forms at the spot, which has itched from time to time. A few hours later a vesicle forms, the top of which is invariably rubbed off by scratching; the spot becomes redder and hard, the induration extends and the central part gradually changes to a dark grey or brown colour, and ultimately, by about the end of the second day, to a black or grey-black colour. Around this black patch a ring of vesicles forms, the individual vesicles being small, usually not larger than a canary seed. The swelling may extend and sometimes produces immense tumefaction of the neighbouring parts. When the face is attacked the features often become quickly concealed and unrecognizable, the eyes disappearing entirely in the swollen tissues. Neighbouring glands are generally enlarged, though without much tenderness, and red lines often ramify towards the nearest important collection of glands—*e.g.*, towards the axilla when the arm is the affected part. The patient may die on the fourth or fifth day, by which time the black eschar will rarely exceed a

florin in area. The surface of the tumour is sometimes red, and may be either hot and inflammatory, or cool; it is sometimes emphysematous.

The patient is perfectly conscious and clear in his mind, even when the rapid irregular feeble pulse betrays the serious nature of his disease. There is usually a good deal of local swelling before any complaint is made, but not infrequently he dies without complaining of any symptoms whatever, always answering that nothing ails him. Sometimes there is slight headache and dry tongue, but prostration and a feeling of "sinking" are the symptoms most often complained of, and also a feeling of uneasiness about the chest, hardly amounting to dyspnoea. The temperature usually rises for a brief period to 100° or 101° F. (rarely higher), but this temporary rise is soon followed by a sub-normal temperature, the thermometer standing at 96° and even 95° F. The fever is never a serious element in the disease, and the worst cases are those in which the temperature ranges lowest.

Course.—It sometimes happens that the general symptoms remain in abeyance and the ailment continues entirely local, and gradually disappears, the eschar sloughing out and the sore healing, with disfigurement proportionate to the amount of tissue destroyed. The eschar is sometimes thrown off without suppuration after the formation of a line of demarcation from the healthy tissues.

It sometimes happens that no distinct local sore is formed in the early stage, although there is extensive oedema, which has spread from a centre. Later on, if the patient survive more than three or four days, which is rare in these cases, pustules may form with eschars. If the case become one of general infection the symptoms resemble those of general anthrax (*q.v.*).

Diagnosis.—The nature of the case will generally be apparent, when the local sore has developed. Where this is not so, one most striking feature is the disproportion between the symptoms and signs, there being perhaps utter prostration without any discoverable cause. The co-existence of perfect mental lucidity, with conditions so evidently pointing to a critical state of the patient, which he does not realize, is very suggestive.

Microscopic examination of the effused fluid from the pustule or the surrounding oedema may, by the revelation of the presence of the bacillus anthracis, prove the case to be specific anthrax, but the bacilli may be entirely absent from the

inflammatory exudation, and also from the blood up to a short time before death.

Prognosis.—The gravity of the case depends mainly on the occurrence of a general infection of the organism; death, when it occurs, being due to this cause, and not to the local lesion.

Pathology.—If the disease become generalised it is essentially a case of anthrax, and differs in no way from disease acquired by internal absorption, except that it is less fatal (*vide infra*).

Structure of the Pustule.—There is usually a crust on the top of the eschar, consisting of amorphous exudation and debris of the superficial tissues, which may contain a few specific bacilli, with other microbes. It consists of the mortified papillae and upper part of the derma. Its parts are quite disorganised and it presents no structure, nor is nuclear staining possible. It is separated from the still living parts of the subjacent derma by a layer of embryonic cells, a sort of rampart between the living and the dead tissues. The subcutaneous cellular tissue beneath is infiltrated with exudation and embryonic cells. Anthrax bacilli may be present in the eschar, and if so, will be most numerous in the stratum of embryonic cells. The bacilli are scattered through the derma and subdermal tissues, sometimes in great abundance, sometimes in islets, with clear, intervening spaces, but are not found in the blood-vessels. The bacilli are also absent from the hair follicles, and from the glomeruli of the sweat glands. They do not usually extend beyond the deep cells of the rete mucosum. When they penetrate the rete mucosum they speedily cause destruction of the epidermis, and the formation of microscopic eschars. By the coalescence of several of these, larger eschars are formed. The skin and subdermic cellular tissue are frequently infiltrated with gelatinous exudation, rather resembling in consistence the vitreous humour of the eye.

Treatment.—There is no drug which can be administered with any hope of destroying the virus within the system. The administration of antiseptics internally with this view is useless, and may be injurious. The main indications are to destroy the nidus of the bacilli, so as to prevent general infection of the organism. To this end active surgical treatment is called for, and the earlier it is employed the more likely is it to be successful.

The destruction of the pustule is best

effected by the thermo-cautery or other powerful caustic, as incision may lead to the introduction of the virus into the blood through gaping wounds in the vessels. The application of roughly powdered bichloride of mercury to the raw surface is strongly recommended by some. It causes a hard, dry eschar to form. Potassa fusa, Vienna paste, carbolic acid, and chloride of zinc have also been employed for the same purpose. The local application of powerful disinfectants is especially useful, and subcutaneous injections into the œdematous tissues of such fluid is also to be recommended. For this purpose weak solutions of iodine, carbolic acid, or bichloride of mercury are the best. The injections should be made once or twice daily in several places, according to the size of the infected part. Internally, quinine, ammonia and bark, carbolic acid and iodine are especially advisable, with abundance of beef tea, eggs, and wine; in fact, any form of good nourishment which is acceptable and digestible. The bowels and skin must be attended to, and, if there be evidence that the virus entered by the intestines, active purgation and the administration of iodoform in pills, with a coating insoluble in the gastric secretions, are indicated.

INTERNAL ANTHRAX.—The virus of anthrax may be spontaneously absorbed otherwise than through a wound in the skin. In such cases it produces a disease known as internal anthrax. This form of the disease is undoubtedly due in the majority of cases to infection from the digestive tract, and probably in most cases the intestine. But infection through the lungs also occurs, and ingenious experiments have been performed (Buchner) to show that, in the case of mice, pulmonary infection is much the most frequent, and also that the bacilli are harmless when swallowed, and that the spores may pass uninjured through the stomach and intestines of those animals. But these experiments did not at all exclude the possibility, or even the probability, that some of the dust containing the virus was swallowed in the cases in which death was attributed to inhalation.

Symptoms.—In Wool-sorters' Disease the symptoms usually come on and terminate with terrible rapidity. They last as a rule three to four days, but a wool-sorter, who was well and at his work at 10 A.M., has been known to die of anthrax at 2 P.M. on the following day.

The patient usually goes to work

feeling in perfect health, and after a time complains of being dizzy, faint, or "out of sorts." Chillsiness follows within an hour or so. Sometimes there are complaints of tightness in the chest, or of dull pain in the front or back of the thorax; but pain is not a prominent feature. Usually as the case proceeds moist râles may be heard over the lungs, but there is no evidence of pneumonia. The temperature, which may rise to 100° or 101° F. for a short time, in the axilla, soon falls below normal. But this fall in the temperature of the axilla does not affect the whole body equally, and erroneous conclusions may be drawn from it. It is a regular experience to find that the rectal temperature exceeds that of the mouth and axilla much more than is normal, sometimes by as much as 1°–2° F. in the former, and 3°–4° F. in the latter.

Frequently the body is bathed in cold, clammy sweat. The patient is very weak and prostrate; he is dull and dejected, the breathing is quick and shallow, the pulse rapid and very feeble, but the mind is usually clear. Liquid nourishment is taken readily to the last. As the end approaches unconsciousness supervenes, and the breathing becomes laboured. Among the less common symptoms are delirium, diarrhœa, and severe pains in the limbs and joints.

When the local sore is extensive and foul, there may be added to the symptoms of anthrax those of wound fever, or pyæmia.

The symptoms in cases which do not run so rapid a course, generally commence with a feeling of fatigue, dull pains in the limbs and headache, singing in the ears and giddiness, with general feeling of malaise. These symptoms may be followed by pain in the stomach and bowels, with distension, vomiting and diarrhœa, the motions being sometimes bloody. As the case progresses the breathing becomes embarrassed. There is cyanosis, restlessness, or perhaps drowsiness. The pulse is generally quick and compressible. The temperature in the axilla is but slightly increased. If the case does not soon take a favourable turn, cyanosis and algidity occur with profound prostration, and the patient dies.

Morbid Anatomy.—The following are the chief changes observed. At the seat of experimental inoculation in animals there is never a tumour similar to the "malignant pustule" of man. There is, indeed, rarely pus, or other evidence of

inflammation. In animals death generally ensues so rapidly that there is little time for extensive lesions to form in the tissues. As in man the blood is not coagulated, but dark and liquid. Externally there is commonly more or less cyanosis, notably of the extreme points, nails, tips of ears, &c. There is sometimes subcutaneous emphysema, no doubt from rapid decomposition. Microscopical examination and cultivations of blood and exuded fluid may show the presence of the specific bacillus, and inoculation of mice or guinea-pigs proves the pathogenic properties of the microbe. Ecchymotic patches also occur in the lymphatics, and elsewhere. There is usually more or less exudation of serum, sometimes bloody, sometimes clear and straw-coloured, into the serous cavities. The serous surfaces of the stomach and intestines commonly present ecchymoses, varying in size from a pin's head to that of a shilling, and either light or dark red in colour. The mucous surface is generally not affected. Clear, gelatinous infiltration is often found under the sternum, and around the kidney and other parts. The spleen is enlarged and soft, or even diffuent, and very dark. The lymphatic glands, especially near the pustule, are large, dark in colour and engorged with blood. Mediastinal cellulitis with an engorged and hemorrhagic condition of the bronchial glands are also characteristic appearances.

Pathology and Aetiology.—The specific organism, the bacillus anthracis, was first observed by Delafond (1848), but Brauel (1857) first described it as pathognomonic. The researches of Pasteur, followed up and completed by those of Koch, definitely established the causal significance of the bacillus.

The bacilli are not, as a rule, to be found in the blood during life, but may be discovered in small numbers immediately before death; shortly after death the blood swarms with them. They appear then under the microscope as motionless, straight, clear, cylindrical rods in length from twice to ten times the diameter of a human red blood-corpuscle. The longer ones are found to consist of several short ones united by their extremities, the individual bacilli being about the diameter of a human red blood-corpuscle, and in breadth about a quarter to a third of their length. When stained with basic aniline colours—*e.g.*, methyl violet—a bright unstained spot appears at the junction between two bacilli, due to the ends of each being concave, and

thus leaving a space when brought together end to end (*see* Figs. 13 and 14, p. 521).

The bacilli multiply by fission within the body, but by fission and endogenous sporulation out of the body in a suitable medium, they grow readily in neutral peptone-broth-gelatine, milk, urine, on vegetables, &c., at the ordinary temperature of the air, and produce spores at temperatures between 12° and 43° C. (= 53.6° and 109.4° F.) The bacillus grows in a suitable culture-medium into long, undulating filaments, which, when stained, exhibit spores, distinguishable by not absorbing the colouring matter in the ordinary way.

The macroscopic appearance of a cultivation in or on gelatine is as highly characteristic as the microscopic appearance of the organism. Gelatine culture-medium (10 per cent.) begins to liquefy at the top from the third to the fifth day.

The bacillus is easily killed by heat, cold, desiccation, disinfectants, &c., but the spores are much more resistant: the bacillus will die in 1 per cent. solution of carbolic acid in ten seconds, but the spores will resist a 5 per cent. solution for over a month; bacilli perish in water at 55–60° C. (= 131–140° F.) in ten to fifteen minutes, but spores will resist a temperature of 100° C. (= 212° F.) for some minutes.

The process of digestion will destroy bacilli, but spores can resist it, and, by being absorbed in the intestine, may cause general infection.

At the present time it is not known that there is any material evolved by the bacillus which produces the symptoms, as has been proved by Roux to be the case with the bacillus of diphtheria.

Incidence of Anthrax.—The disease never occurs spontaneously in man. The virus in cases of internal anthrax may be derived from the consumption of meat, milk or butter from infected animals, or from dust inhaled or swallowed, as may occur during the preparation of certain mohairs and alpaca, which are usually very dry, and give off clouds of dust. The disease is practically limited to persons brought directly in contact with the virus developed in infected animals—*e.g.*, shepherds and cowherds, stable-men, slaughtermen, farmers, hide and skin dressers, and persons engaged in preparing wool, hair, bones, horns, &c. Woollsorters believe that a person may have many

slight attacks, and at last be fatally attacked; but it is proved experimentally that animals (sheep, cattle, horse, mule, ass, &c.) may be protected for some time by giving them a mild attack by inoculation of attenuated virus.

Treatment.—The indications are the same as for the local disease (*vide* MALIGNANT PUSTULE). Various methods of attenuation of the bacillus for preventive (not curative) inoculation have been practised. Pasteur uses two "vaccines." The first (weaker) has been attenuated by keeping at 42–43° C. (=107.6–109.4° F.) for twenty-four days; the second (stronger) has been similarly treated for twelve days. They are inoculated at an interval of twelve days. The attenuated bacillus may be propagated without increasing its virulence, or it may be restored to its primitive virulence by suitable cultivation. Chauveau used oxygen, Arloing utilized the action of sunlight, others have used certain disinfectants (carbolic acid, &c.) to effect attenuation. After "vaccination" with attenuated virus, animals enjoy immunity for about a year.

T. W. HIME.

PYELITIS, (including **Pyelonephritis** and **Pyonephrosis**).—Inflammation of the pelvis of the kidney. If combined, as is often the case, with inflammation of the kidney substance itself, the term "pyelonephritis" is given to the disorder; while if the purulent results of the inflammation are pent up in the pelvis of the kidney the resulting cyst, filled with pus, is called a "pyonephrosis."

Pyelitis is produced by the mechanical irritation of calculi or blood-clot lodged in the pelvis of the kidney, or by the presence of parasites, tubercle, or tumours in its mucous membrane. Pyelitis may also arise in the course of various specific fevers, of diabetes, and of chronic Bright's disease. It may be the result of cold or of the action of turpentine, cantharides and other irritant diuretics given internally. Stagnation of urine in the pelvis of the kidney and ureters, especially if the urine be decomposed, is prone to set up severe pyelitis. Such stagnation may be due to obstruction in the ureter or to pressure upon the tube from the outside, as by a tumour or the pregnant uterus. Inflammation may extend to the pelvis from the lower urinary passages, from the kidney itself, or from neighbour-

ing tissues. When secondary to bladder or urethral disease, pyelitis is a variety of so-called SURGICAL KIDNEY (*q.v.*).

Symptoms.—The early symptoms are pain and tenderness in one or both lumbar regions. A slight amount of pyrexia may be caused by the pyelitis alone, independently of the original disease. The urine is generally faintly acid, contains a large quantity of mucus, and deposits copiously the characteristically irregular epithelial cells of the pelvis of the kidney. A small quantity of blood also may be present in the urine. Somewhat later, the irregular cells become fewer in number and pus corpuscles take their place. The urine contains albumen, but in quantity only proportionate to the amount of blood and pus which are found in it, provided that the inflammation be confined solely to the pelvis of the kidney. When the disease has extended to the kidney substance proper, constituting a pyelonephritis, albumen appears in larger amount, and with it various forms of casts and cells from the renal tubes may be found in the urinary deposit. The urine is commonly passed more frequently than is normal. There may be rigors, becoming more pronounced and frequent as pus formation is more definitely established. Accompanying the rigors, the temperature shows variations resembling those of hectic fever. The bowels act irregularly. Usually there is obstinate diarrhoea, but when the pelvis of the kidney becomes so distended as to press upon the colon constipation is observed.

The condition of the urine as described above is subject to variations, for ropy mucus and viscid pus, coagulated blood, epithelial debris, or portions of calculus and hydatids, according to the nature of the original cause of the inflammation, tend to obstruct the lumen of the ureter, and so lead to the accumulation in the pelvis of the kidney of the inflammatory products which no longer reach the bladder. If the disease be unilateral the urine now becomes normal, since it comes from the normal kidney; if bilateral the abnormal deposit in the urine is diminished in amount; such obstruction is usually temporary. When at last it is overcome, there is a sudden rush of the pent-up secretions and the urine is again loaded with pus, mucus and epithelium.

The accumulation of inflammatory products distends the pelvis of the kidney,

and in the later stages causes a swelling to appear in the lumbar region. This swelling has the ordinary character of a tumour of the kidney, it is crossed by the colon, it can usually be separated from the liver and spleen respectively, and it often causes distinct bulging, not only in front but behind, in the loins. It is dull on percussion, presents obscure fluctuation, is tender on pressure, and is the seat of dull, aching pain. The swelling may attain a considerable size, but is in this respect subject to variations according to the relatively closed or open state of the ureter as mentioned above.

When a swelling has formed in the flank, the urine may still possess the characters already described. By this time, however, it has in most cases decomposed and become alkaline and ammoniacal. In certain cases the distended pelvis is completely shut off from the lower urinary passages, and then, provided that the opposite kidney be sound, the appearance of the urine is normal.

The symptoms described above are those which are due to the pyelitis itself. In addition, the primary disease, whether stone, hydatids, or tumour of the kidney, will cause its own characteristic symptoms, which may even entirely overshadow those of the secondary pyelitis.

Results.—When free communication is maintained between the kidneys and the bladder, the discharge may gradually disappear, or it may continue profuse and the patient be exhausted by the drain. The sac of a pyonephrosis may undergo spontaneous cure. This occurs in several ways. The pus may become inspissated; if so the sac contracts, its walls thicken, and at last nothing may be left but a mass of fibrous tissue in the place of the kidney. Again, the contents of the sac may become caseous, especially if the exciting cause be tubercle. Lime salts may be deposited in the inspissated pus in such amounts as to cause absolute obliteration of the sac and its transformation into a calcareous mass. Lastly, the sac may burst, and the liberated pus may make its way along various channels; these are mentioned under the headings SUPPURATIVE NEPHRITIS and PERINEPHRITIS.

Diagnosis.—Without tumour in the flank, the symptoms of pyelitis are likely to be mistaken for those of cystitis, and it must be remembered that the two conditions may be combined. With

pyelitis there is pain and tenderness in the region of the kidneys, the urine is more frequently acid than in cystitis, and there may have been a history of renal colic or renal hæmaturia, pointing to a stone in the pelvis of the kidney. The character of the cells found in the urine will not help in the diagnosis. The tumour of pyonephrosis must be diagnosed according to the rules for other renal tumours. Its fluctuation, deeper than that of perinephritic abscess, its regular form, the preceding pyrexia, and the constitutional symptoms of suppuration will serve to distinguish the pyonephrosis from other tumours of the kidney. The fluctuations in size of the tumour, corresponding with variations in the state of the urine, constitute an important diagnostic feature.

Prognosis.—This depends on the cause of the disease. If it be due to cold or to one of the general diseases mentioned, it is commonly of little importance. If caused by obstruction to the lower urinary passages, it adds materially to the gravity of the prognosis, whatever may be the nature of the obstruction. The rupture of a pyonephrosis is a very serious matter. The recent advance in renal surgery has rendered the treatment of cases of pyonephrosis more successful than formerly, and though the condition is grave, favourable results may be obtained by the adoption of proper measures.

Pathological Anatomy.—In the early stages the mucous membrane of the pelvis of the kidney is congested, and may even show ecchymoses. Microscopic examination reveals proliferation of the epithelial layer. Sometimes, in severe cases, portions of false membrane may be seen to cover the surface of the pelvis. In the later stages, the mucous membrane is thickened and of a greyish colour. It is often ulcerated in patches, while on microscopic examination the tissue is seen to be infiltrated with leucocytes, and the normal coating of irregular and dove-tailed cells is exchanged for layers of leucocytes. The pelvis is now more or less dilated, and the infundibula become merged into the general cavity.

In pyelo-nephritis, in addition to the changes mentioned above, the kidney shows the appearance of parenchymatous nephritis, or even of acute interstitial suppuration.

When pyonephrosis has formed, the appearances vary according to the stage which has been reached. A sac of pus

is invariably found, to which may be attached an almost normal kidney. As the distension of the pelvis increases the kidney-substance atrophies, so that finally nothing is found but a loculated sac, constituted by dense fibrous tissue, filled with more or less inspissated pus and degenerated epithelial cells, with possibly a calculus or other matter which has been the exciting cause of the inflammation. If the urine has remained acid, a deposit of uric acid or urates may be found. When, however, the urine has become ammoniacal, phosphates are deposited. Adhesions are commonly observed between the sac and surrounding parts.

Treatment.—The cause of the pyelitis must be treated by the measures appropriate to each condition. The pyelitis itself may be treated in the early stages by rest, warm fomentations and poultices, and leeches or cupping applied to the loins. The diet should be light and easily digestible, diluent drinks should be administered freely. Pain, if severe, may be alleviated by the use of opium. When the disease has become chronic and a pyonephrosis has developed, the object of treatment should be to diminish the secretion of pus and promote the obsolescence of the suppurating sac. To this end, the internal use of the mineral acids, the perchloride of iron, alum, and other astringents may be tried. In very chronic cases turpentine, best given in capsules, and tincture of cantharides, have been found of value in checking the inflammation. The patient's strength must be maintained by nourishing food, quinine, cod-liver oil and change of air. If, however, there are signs of hectic and the patient is becoming emaciated and worn out by continuous discharge, palliative treatment is no longer to be pursued, and surgical interference is urgently called for. Nephrotomy must be performed according to the recognized rules of surgery. Further, when the kidney has been transformed into a cheesy mass, and also when, after incision, the abscess cavity refuses to close, the more serious operation of removing the whole kidney (nephrectomy) may be required.

ROBERT MAGUIRE.

PYLORUS, OBSTRUCTION OF.

—The pylorus may become obstructed from the cicatrization of a neighbouring ulcer, or from fibroid thickening, but most commonly it results from cancer. It may also be due to the pressure of neighbouring tumours and to spasm

arising from the presence of an ulcer in the neighbourhood.

Symptoms.—Pyloric obstruction is evidenced by pain and vomiting. The pain steadily increases as digestion proceeds, and extends from the epigastrium round the waist. If the obstruction be severe it is only relieved when vomiting occurs. Vomiting is delayed till four hours or more after food, or may occur only once a day, or at still longer intervals, and is profuse in amount on account of the dilated state of the stomach. The vomited matters may contain sarcinæ and torulæ (see figs. 7 and 12, p. 521), but no bile, the regurgitation of which is barred by the obstructed pylorus. As obstruction increases, the stomach becomes dilated and its muscular coat hypertrophied.

On examination of the abdomen, while the symptoms are at their height, and before vomiting has taken place, a depression of the epigastrium and a fulness of neighbouring regions of the abdomen, especially of the *left* hypochondrium, will probably be detected, and peristalsis may be observed. The area of stomach dullness or the stomach percussion-note will be extended downwards. A succussion splash may be felt, or heard with the stethoscope. The heart will probably be found displaced upwards. The range of the stomach downwards may be plumbed with a probang.

Diagnosis.—The differential diagnosis between obstruction due to malignant and non-malignant disease is often a matter of considerable difficulty. It turns mainly on the presence or absence of a defined tumour, but also upon the age of the patient and the history of the case. The degree of emaciation is rarely of much service as a guide, as it is usually considerable in either case, owing to the small quantity of food absorbed. Obstruction of the duodenum from the cicatrization of an ulcer and subsequent dilatation of the pylorus is a condition practically indistinguishable from pyloric obstruction (see ABDOMINAL TUMOURS).

Prognosis.—If the obstruction be of cancerous origin, the condition is necessarily fatal; if it be due to cicatrices or fibrous thickening and is partial only, careful feeding combined with washing out of the stomach may enable the patient to live in comfort; but if it be complete, operative means can alone give permanent relief.

Treatment.—An attempt must be made to utilize the stomach to the extent of its power without overloading it. To

this end, some fluid food, as plain soup, milk, arrowroot or gruel, should be given in quantities not exceeding $\frac{1}{2}$ pint, at three-hour intervals. If this be tolerated the quantity may be cautiously increased, and a little bland, solid food, such as bread soaked in milk or finely minced meat, may be experimentally added, until the limit of the digestive power of the stomach has been ascertained.

To remove, as far as possible, the risk of distension by gas, fermentation should at the same time be checked by the administration of 1 grain of carbofic acid or 1 minim of creasote, or $\frac{1}{2}$ grain of thymol, in pill, or a drachm of sulphurous acid in 3 ounces of water, or a teaspoonful of charcoal stirred up in water, once or twice a day.

Pain should also be relieved, and irritability of the gastric wall reduced, by morphine, belladonna, or hyoscyamus. Hydrocyanic acid is sometimes useful.

If tolerance of ordinary food cannot be established by the above means, artificially digested aliments may be substituted, but in the majority of cases it is necessary sooner or later to prepare the stomach for the reception of food by a systematic process of "washing out," and as a rule the earlier in the case this mode of treatment is adopted the better for the patient. The operation should be conducted at first half an hour before each meal.

The instrument used (Tosswill's siphon) is a long soft india-rubber tube, fitted with a ball pump. The patient being seated the tube is slowly passed into the stomach with a gentle rotary movement. The patient will very soon be able to do this for himself. Water is first injected into the stomach, the organ is then completely emptied of its contents and subsequently washed out with tepid water containing dilute sulphurous acid (a drachm in 2 to 3 ounces of water). The meal taken half an hour later should be as "dry" and of as small a bulk as possible. After a week or so the washing may be done less frequently, once a day being soon sufficient, but care must be taken not to allow the stomach to become distended. Under this treatment vomiting ceases and nutrition markedly improves; in fact it offers to the subject of pyloric obstruction immunity from some of the worst consequences of the condition.

Rectal feeding may, of course, be resorted to as an aid to other measures.

The operation of digital stretching of the pylorus (Loreta's operation) has

been performed with success in a few cases, and is worth a trial if other means fail.

Another surgical procedure, known as "short-circuiting the duodenum," in which the stomach is united to the upper part of the jejunum has been resorted to in a few cases. ISAMBARD OWEN.

PYOMETRA.—Pus within the uterus. The condition is rare, and occurs almost exclusively in old women who have ceased to menstruate. The pus is the result of endometritis, and its escape may be prevented either by atresia of the cervix from cicatrization, by blocking of the cervix by fibroid or cancerous growth, by fixation of the uterus in a bent shape by adhesions, or by "kinking" of the thin-walled uterine canal by flexion.

Symptoms.—Pyometra *per se* causes few symptoms, and those of a vague kind. It is usually discovered owing to advice being sought for the disease of which pyometra is an effect; and it has often been unexpectedly found post mortem.

The treatment is to open up the cervical canal and let out the pus.

G. E. HERMAN.

PYROSIS (Water-brash).—Strictly speaking, pyrosis means heartburn, but it is always used to indicate the ejection of a clear watery fluid from the mouth in certain forms of gastric disorder. An attack commences with severe spasmodic pain and a sense of constriction at the epigastrium, which is not relieved until this clear, tasteless fluid is ejected. The quantity is generally small, about two or three ounces, but may be a great deal more; it is non-albuminous, and has been found by some observers to contain sulphocyanide of potassium, a fact which would point to its consisting in part at least of saliva; others believe that it is produced in the stomach, chiefly near the pylorus. Pyrosis is a symptom of dyspepsia rather than of organic disease of the stomach, and is commoner in women than in men; it is met with much more frequently in some districts than in others, and is believed to be largely due to the coarse character of the diet adopted by those who suffer. The astringent vegetable infusions (gentian, orange, cinnamon, or any containing tannic acid) in ounce doses, combined, if need be, with small doses (5 to 10 minims) of laudanum, give the most satisfactory results in treatment.

PYURIA.—The presence of pus in the urine. This condition may depend upon disease of any portion of the urinary or genito-urinary tract. Increased frequency of micturition is the only symptom common to all the different forms, and even this is not constant.

Characters.—The urine is generally slightly albuminous. Its appearance varies with its reaction when passed. If *neutral* or *acid*, it is turbid, and gradually separates into an ivory-tinted sediment and clear supernatant urine. Urates may impart a pinkish tinge to the deposit, but more often they occur as an upper stratum. The addition of an equal bulk of liquor potassæ to a portion of the sediment dissolves the pus cells and renders the resulting mixture clear, and at the same time so tenacious that, when poured from the test-tube, it falls *en masse* like imperfectly set jelly. A deposit of triple phosphates (NH_4MgPO_4) may be distinguished from that of pus by the fact that it is whiter and more flocculent, is soluble in acetic acid, and occurs but rarely in acid urine. When the urine is *alkaline*, as for example in cystitis, the sediment is less defined, but forms more rapidly. It is tenacious andropy, while the supernatant fluid remains cloudy. The urine is often fœtid and generally contains a deposit of triple phosphates. The addition of liquor potassæ to the deposit may slightly increase its tenacity; the less ropy and tenacious the sediment, the more marked will be the effect of the liquor potassæ. If necessary, pus may be distinguished from mucus by the addition of corrosive sublimate, which precipitates pyin but not mucin (Ralfe). Under the microscope, pus cells will, in any case, be seen as globular bodies somewhat larger than red blood discs and granular; the addition of acetic acid clears up the granular contents and brings the nuclei into view.

These are small, two or three to each cell, partly superimposed or closely aggregated, and often take the form of a bent chain with three links.

Causation.—(1) In renal abscess the pus is in small quantity, and some of the cells may be found imbedded in casts from the renal tubules. The urine generally contains blood and is of acid reaction. (2) In the so-called surgical kidney (acute consecutive nephritis) the characters of the pus are much the same; cystitis often coexists, and the urine will vary accordingly, but the presence of pus casts would be conclusive evidence that the kidney was affected. (3) In pyelitis, owing to occasional temporary blocking of the ureter, the urine varies greatly; at one time there may be a copious deposit of pus, at another none at all. In the early stages red corpuscles may be found as well as swollen epithelial cells—spindle-shaped, caudate or spheroidal—from the pelvis of the kidney. (4) In cystitis the urine is alkaline and presents the characters already described. (5) In urethritis or inflamed prostate the pus is small in amount and imperfectly mixed with the urine, forming small shreds. A drop or two can generally be squeezed from the orifice of the urethra. (6) In leucorrhœa or vaginitis, the quantity is small, and vaginal pavement epithelium abounds in the deposit. (7) If an abscess burst into any portion of the urinary tract, the pus is at first passed in large quantities, and then either disappears altogether or a small quantity is passed daily. In gouty subjects or those who have suffered from previous attacks, a very slight cause, such as a trifling error of diet or a chill may produce a transient pyuria.

The pathology and treatment are considered in the descriptions of the diseases which give rise to this condition.

H. MONTAGUE MURRAY.

R

RAYNAUD'S DISEASE (Symmetrical Gangrene).—This affection, named after Maurice Raynaud, who first accurately described it, includes at least three fairly well defined disease states, which probably correspond to different stages of the same morbid process.

These are, in order of increasing severity, **Local Syncope**, **Local Asphyxia**,

and **Local Gangrene** (*Symmetrical Gangrene*).

The essential factor in the disease appears to be a narrowing (vaso-motor spasm) of the small arteries and capillaries in certain parts of the body, notably the extremities, attended by great retardation or even arrest of the capillary circulation; whilst the general character and symptoms of individual

cases are chiefly dependent on the situation, extent, and nature of the effects of the vascular disturbance on the nutrition of the affected areas. The symmetrical arrangement of the lesions is often very striking, and constitutes a diagnostic point of some importance, but it is not constant, as was formerly believed, and unfortunately led to the adoption of the somewhat inappropriate term symmetrical gangrene.

Local Syncope.—The phenomenon familiarly known as “dead finger” is essentially local and compatible with perfect health. Females suffer more than males. The commonest determining cause is cold, but a degree of cold which would produce no effect on individuals not predisposed. This statement applies equally to the other forms of the disease. Sudden emotion and mental shock are mentioned as causes, and the coldness of the hands which accompanies nervousness is suggestive in this connection. The condition is also sometimes observed after meals. The affected fingers or toes become cold, dead-white, and bloodless; cutaneous sensibility is blunted or abolished; and motor power may be temporarily lessened. The attack is transient, and is succeeded by a period of reaction which is often painful.

Local Asphyxia.—In this form of the disease the affected parts become cold and cyanotic. The skin assumes a bluish-white, violet, slate-coloured, or blue-black tint not unlike an ink-stain. The lesions are symmetrical in the large majority of cases, and most often affect the extremities. In some cases they are limited to one or more fingers or toes, whilst in others a segment or even an entire limb may be involved. The severity of any given case does not necessarily stand in any definite relation to the surface extent of the lesions. Next to the limbs the ears are most frequently involved, and less commonly the tip of the nose also suffers. Much more rarely the appearance of symmetrical livid patches on the backs of the hands or some other part of the arms, legs or trunk, constitutes the only deviation from health. There is often slight œdema of the affected parts, and livid venous marblings above the level of the discoloured areas are common. The capillary circulation in the livid patches is always much retarded, so that the dead-white mark caused by pressure with the finger-tip is always slow to disappear. Pain is a very frequent, but not invariable, symptom. It

may be localized in the livid extremity or radiate through the affected limbs. It is at times of an excruciating character, and may precede the appearance of the lividity. There is generally more or less complete cutaneous anæsthesia, which interferes considerably with the performance of fine movements, and there is nearly always some loss of motor power. The period of reaction is usually attended by irritating, tingling sensations.

The *progress* of local asphyxia is mostly paroxysmal, periodicity being often well marked and frequently of quotidian type. In such cases each attack commences in the same region and follows the same order of development, the blueness lasting from a few minutes to several hours.

As the attack passes off, less livid patches make their appearance in the affected region, and gradually coalesce; at the same time, a zone of vermilion colour invades the blue skin from the proximal side, eventually giving place to the normal pink colour of the skin. When the asphyxia is limited to the fingers or toes, there is no appreciable disturbance of the arterial circulation; but when it occupies the whole of a limb, the pulse may become small and feeble at the commencement of the attack, the beats recovering their usual strength and volume as the asphyxia subsides.

In course of time a sort of flabby false œdema of the affected digits may become established, but is by no means common. This has been attributed to an overgrowth of the subcutaneous cellulose-adipose tissue. More often the fingers gradually acquire tapering extremities. The general health, as a rule, is good. Not a few of the subjects of this disorder, however, are chlorotic and hysterical.

The differential *diagnosis* from cyanosis due to other causes is easy. The absence of organic heart or lung disease, the occurrence of local pain or tingling, the intermittent character of the affection, and the absence of clubbing of the fingers are some of the more important diagnostic signs of the disease.

The ultimate *prognosis* is usually favourable; but it must be borne in mind that local asphyxia may eventuate in local gangrene, although the symptoms of this condition do not invariably precede those of the graver disease.

Local or Symmetrical Gangrene.—In this form of the affection the extremities become first exsanguine and then blue, or from the first assume a purple or reddish livid hue. At the onset the

affected areas are often the seat of itching or tingling sensations, and the patients commonly believe they have chilblains. These early pains are often relieved temporarily by the application of cold, but in the course of a few days increase greatly in severity, whilst the deepening violet colour and icy coldness of the parts, leaves little doubt as to the nature of the affection. At this period livid marblings usually make their appearance in the neighbourhood of the affected part, extending for a varying distance up the limb. Beyond this stage the progress of events varies in different cases. In some, one or more digits become entirely black and insensitive; small blisters form on the tips of the fingers, break, and eventually heal up in the course of a few days, as the vitality of the part becomes restored. Such a recovery is often but temporary, being followed at intervals by a series of similar attacks affecting the same or other digits. In such cases, at an advanced stage of the disease, a number of small, hard, white, depressed scars may be seen on the pulp of all the fingers. The affected digits tend to become conical, shrivelled and tough, resembling parchment. The digits, however, may become mummified without the previous occurrence of blisters.

In other cases the gangrene develops more rapidly. The extremity of a digit or an entire phalanx rapidly becomes black and icy cold. Blisters do not form, but the affected part is sometimes covered with beads of sweat. In the course of a few days a line of demarcation forms at the proximal side of the necrosed tissues, which are then gradually thrown off by suppuration. The slough is often not more than one or two millimetres in thickness, although the aspect of the part before its separation might lead one to expect much deeper destruction. Sometimes, however, the process results in the loss of part or the whole of the ungual phalanx, or of the whole digit, and in cases of exceptional severity whole segments of limbs may separate. The remaining stump is covered with granulations, which generally heal rapidly. Not rarely the several stages of the process occur simultaneously in the same patient.

Although the gangrene commonly affects the extremities, a good many cases are recorded in which other parts of the body were attacked. Thus, in several instances, gangrenous patches have appeared on the heels, malleoli,

calves, tibiae, &c., parts be it observed which have a counterpart on the other side of the body. More rarely mortification attacks the nose, and has been known to destroy it almost entirely, whilst considerable damage may result to the helix of both ears from repeated attacks of the disease.

When the extremities are the seat of the disease the growth of the nails is always arrested during an attack. Sometimes the nails are shed; at others, when they have grown again, a transverse depression indicates the period of arrest.

Pain is the dominating symptom of the disease. The numbness which accompanies local syncope is here replaced by darting or burning pains, either limited to the affected parts or radiating through the limbs. These pains may be prolonged for weeks, and are often excruciating. The affected parts are insensitive and their motility is always more or less impaired. A true motor paralysis may become established from the association of peripheral neuritis. As regards the circulation, there may be an initial rise in the pulse-rate without elevation of temperature. Livid venous marblings are often present, and the capillary circulation is always slowed. The arterial pulse in the affected limb may diminish temporarily in volume, but never becomes altogether obliterated. The general health of the patient is usually good.

The *progress* of local gangrene may be continuous or intermittent, but the continuous type is relatively rare. Speaking generally, the most profound gangrenes present most regularity in their development. Raynaud describes three stages:—(1) The period of invasion, during which symptoms of local asphyxia predominate; (2) the stage of painful crises, during which the gangrene becomes limited and complete; and (3) the period of elimination, which is of varying duration, generally from three to four months, sometimes longer.

Diagnosis.—This should not present any difficulties; still, in the earliest stages there may be some difficulty in distinguishing from chilblains. Gangrene once established, the diagnosis from senile gangrene rests mainly on the age of the patient (the average age of over 120 cases was about 27 years), the symmetrical or multiple character of the lesions, their incomplete and limited nature, their non-progressive character, and the previous state of the vessels leading to the affected areas. From gangrenous

ergotism, the chief diagnostic sign is supplied by the history.

The *prognosis* is grave, but not unfavourable. Patients seldom die of the uncomplicated disease, and experience uniformly shows that the actual amount of destruction is nearly always very far short of what the earlier stages of the process (asphyxia, coldness, &c.), seem to foreshadow. In very young children, however, the disease may assume a very acute and destructive type. There are on record several such acute cases, in which symptoms of asphyxia and gangrene have progressed uniformly and uninterruptedly to a fatal issue in from two to four days. If gangrenous patches make their appearance within fourteen days of the date of invasion, there is a reasonable hope of recovery in four or five months. The immediate prognosis is, however, less good in the milder cases of intermittent type with recurring blisters and cyanosis. Although not dangerous to life, this form of the disease often exposes the patient to long-continued and intolerable pain.

Pathology and Ætiology.—This somewhat rare disease is relatively frequent amongst children, and a considerable portion of the cases occur between fifteen and thirty, but after that age the liability to the affection diminishes. The oldest well-authenticated case was fifty-nine, whilst a child of eight months under the writer's care presented a well-marked local asphyxia of paroxysmal type. Women appear to be more liable to the disease than men, and it shows a decided preference for persons of a nervous or excitable disposition.

Exciting Causes.—The effect of lowering of the external temperature has been already alluded to. Whether suppression of the menses should find a place here appears doubtful, although Raynaud himself attached considerable importance to this accident.

Attacks of local asphyxia may be ushered in by a fit of passion or follow close upon some sudden mental shock. A considerable number of cases have occurred in lunatics, and it may be observed in this connection that symptoms of hysteria of every grade may accompany the attacks of Raynaud's disease. In one recorded case there was acute mania. A condition of unstable nervous equilibrium thus appears to be an important predisposing factor. Raynaud mentions a case in which a blow on the outer part of the arm in a man was followed by a profound local syncope of

that extremity, lasting continuously for ten days. In a boy of nine, recently under the writer's care, a series of well-marked paroxysms of local asphyxia affecting the left hand was determined by a dog-bite in that situation. This patient was at the time suffering from syphilitic ulceration of the pharynx.

Associated Diseases.—*Intermittent hæmoglobinuria* is often associated with local asphyxia and symmetrical gangrene. The clinical features presented by such cases, as might be expected, vary considerably. In some, dark urine is passed during or shortly after attacks of local asphyxia; or a typical attack of hæmoglobinuria may take the place of a typical paroxysm of local asphyxia.

Or again, a patient suffering from symmetrical gangrene will pass smoky or dark urine at intervals, or suffer from attacks of temporary albuminuria or oxaluria. In other cases patients suffering from paroxysmal hæmoglobinuria spontaneously develop symmetrical or asymmetrical gangrene of the extremities or of the nose or ears.

A study of the recorded cases shows that the alliance is a very close one, and a consideration of the two diseases reveals a marked parallelism between them. Both are essentially paroxysmal in nature, and stand in the same relation to changes of temperature. In the large majority of cases both diseases occur primarily in cold weather, and tend to diminish in warm weather. In both the attacks may be accompanied by some abdominal pain, and be followed by drowsiness and some sallowness of the complexion and conjunctivæ. The alterations present in the blood obtained from the finger of a patient during an attack of hæmoglobinuria—crenation, disinclination to form rouleaux, presence of granular masses in serum, &c.—have also been observed in the blood drawn from an extremity affected with local asphyxia. It has been truly observed that "the two conditions seem so to approach each other and mingle as to make it impossible to draw a distinct demarcation between them." Indeed, the view has been put forward that the two diseases are one and the same, *i.e.*, that hæmoglobinuria is a symptom of the more general affection. On the other hand, it should be pointed out that whereas Raynaud's disease is more common among females, hæmoglobinuria appears to affect a decided preference for the male sex. Malaria, which is an ætiological factor of considerable im-

portance in hæmoglobinuria, has hitherto been comparatively rarely found in association with the allied condition. Lastly, abdominal symptoms, such as epigastric pain, hiccough, colicky pains, nausea and vomiting are usually more prominent symptoms of hæmoglobinuria than of Raynaud's disease. The points of difference are admittedly of degree only, and cannot be held in any sense to impair the close analogy between the two conditions.

Affections of the Skin.—True chilblains are rare, but there are cases of localized subcutaneous purple mottlings, permanent for a time and then gradually fading, with or without pigmentation, which are closely related to local asphyxia. Urticaria—sometimes painful—has been known to occur during the paroxysms of Raynaud's disease. The parchment-like condition of the fingers has already been alluded to. A case is on record in which scleroderma of the chest walls developed in the wake of Raynaud's disease. Two patients suffering from scleroderma of the hands and feet had long been subject to dead hands and feet, and in one of them mild attacks of local asphyxia continued after the onset of the scleroderma. A man who suffered from extensive scleroderma of the trunk and extremities ultimately developed gangrene of the fingers and toes for which no gross lesion could be discovered post-mortem.

Joint Affections.—Effusions into joints—knee, elbow, shoulder, and wrist—have been observed. Fibrous ankylosis of the terminal phalangeal joints and thickenings of the palmar fascia may also occur.

Ague.—In several instances the disease has developed during or shortly after recovery from ague.

Syphilis, congenital or acquired, has been observed in several cases. Its precise bearing, if any, is as yet undetermined, but the well-known vascular and nervous lesions of this disease suggest the possibility of a causal relationship in some instances.

The relation to *peripheral neuritis*—one of considerable interest—is still undetermined. A few cases of symmetrical gangrene are recorded in which unmistakable post-mortem evidence of inflammation of the nerves of the affected extremities was obtained, and in one or two others clinical signs suggestive of neuritis, such as wrist-drop, diminished faradic irritability, &c., have been observed. These cases have been mostly of a chronic kind, and their progress does not

appear to have been much modified by the presence of neuritis. On the whole it appears doubtful whether peripheral neuritis should be regarded as an essential factor in this variety of spontaneous gangrene, and at all events it may safely be asserted that alone it is altogether inadequate to explain the early and paroxysmal stages of the affection (local asphyxia).

As regards the changes in the vessels, the view propounded by Raynaud has been generally accepted, viz., spasm of the capillary vessels, dependent on a reflex exaggeration of the excitomotor energy of the grey matter of the cord which controls vaso-motor innervation (spinal vaso-motor centres). There is some difference of opinion respecting the part of the vascular system which is affected, whether the arterioles alone or the capillaries as well become contracted. It appears probable that during profound local syncope arteries, capillaries and minute venules are all in a state of spasm, and it has been suggested that the supervention of asphyxia may be due to a dilatation of the venules. It is generally admitted that simple spasm is sufficient to account for the phenomena of local syncope and some cases of local asphyxia, but some authorities seem disposed to invoke the aid of another factor to explain the more inveterate cases of asphyxia and the production of gangrene, viz., a degradation of the vitality of the tissues involved, over and above that which must necessarily result from the slowing or temporary arrest of the circulation in the affected area.

The *retinal changes* described by Raynaud and other observers may fittingly be referred to in this place. In one of Raynaud's patients "the sight at times became troubled and confused. When the eyes were examined on these occasions, the central artery of the retina and the arteries which proceeded from it presented very clear contours, and it was established very definitely that they were narrower in their commencement near the papilla than at the periphery; here and there was observed a sort of partial strangulation." Another of his patients complained of dimness of vision at the commencement of some of his attacks of asphyxia. The correctness of these observations has since frequently received confirmation.

Some rare epiphenomena of the disease have been attributed to similar disturbances of the cerebral circulation. Such are mental hebetude on awaking from

sleep, accompanied by a loss of the notion of time and of position in space, temporary aphasia, temporary loss of consciousness and epileptiform seizures.

Treatment.—The affected parts should be protected from the external air by wrapping them in cotton-wool. The local application of warmth often relieves the painful crises, but in some cases cold applications have proved more efficacious. Galvanism of the affected limbs has often been attended with good results. This is most conveniently done by immersing the hand or foot in a basin of hot water containing the negative electrode whilst the other electrode of the constant-current battery is applied over the upper part of the limb or over the spine, due care being taken to thoroughly moisten the skin and the electrode before the latter is applied. The current employed should be of such strength as the patient can comfortably endure, and it should be frequently interrupted so as to cause moderate contractions of the limb. This mode of stimulation is usually better borne by the patient than is friction with the hand. The current may also be applied by simply "painting" with two sponge electrodes applied to the limb at a short distance from each other. It will often diminish pain to such an extent as to enable the patient to bear shampooing afterwards. In chronic cases the good effects of galvanism are less obvious, but even here it is of value in maintaining nutrition and averting gangrene. Shampooing is of especial value in these cases, particularly where atrophy of the extremity with contraction and fibrous ankylosis are taking place. Quinine has been used with good results in cases associated with malaria. In the case of the boy before referred to, the paroxysms ceased with the cure of the syphilitic ulceration from which he was suffering. Nitrite of amyl has been recommended on theoretical grounds, but has not, so far, achieved success. Among sedatives, opium and morphine are the best to combat pain. Careful attention to the general health and the exhibition of plenty of nutritious food are of importance. Among internal remedies, iron in some form is very often indicated. In cases of gangrene of the limited form, the expectant method recommended by Raynaud has been repeatedly justified; but, with deeper involvement of tissues, amputation has been performed with advantage.

W. PASTEUR.

RECTOCELE.—Prolapse of the posterior vaginal wall with the rectum.

The posterior vaginal wall may become inverted and protrude at the vulva, without the rectum. But often it drags the anterior wall of the rectum with it, so that a pouch is formed in the front of this viscus, in which fæces may lodge, and thus the emptying of the rectum becomes difficult or impossible until the prolapsed vaginal wall has been pushed up. Rectocele is usually associated with uterine prolapse, but it may occur by itself.

Treatment.—When associated with uterine prolapse, the treatment is to keep the uterus well supported by a proper pessary. If rectocele exist by itself, or if support of the uterus fail to give relief, the best means of cure is a plastic operation to contract the posterior vaginal wall. In the case of a woman young enough for subsequent child-bearing to be likely, treatment by mechanical support is preferable to an operation on the vagina, for the latter, if extensive enough to be effective, will either much obstruct delivery, or will render delivery only possible by considerable tearing of the parts.

G. E. HERMAN.

REFLEX DISORDERS.—In different parts of this work many affections are described which occasionally own a reflex origin, and others which perhaps are always dependent upon it. It is not intended here to consider each individual instance, but rather to inquire into the nature and origin of the group as a whole by reviewing certain illustrative cases.

—The mechanism by which reflex disorders are produced is the same as that which is required for the performance of reflex actions; indeed, the former often consist of nothing more than reflex action carried to an inordinate and pathological degree. Each case requires the integrity of the reflex arc—*i.e.*, the afferent sensory fibres, the ganglionic centre, and the efferent motor or secretory fibres. This is all that is necessary for the production of reflex action, and in some cases (such as renal colic, caused by a calculus in the ureter) is probably the whole of the mechanism required to induce a reflex disorder. Usually, however, the brain plays an important part, for it undoubtedly exercises a controlling power over reflex action, but opinions differ as to whether this is the result of diffusion of the afferent impulse into other areas or the restraining influence

of a special centre or centres. However this may be, various emotional states have a great effect upon reflex action, and may themselves take the place of, and produce the same result as, peripheral afferent impulses. Such cases are not purely reflex in origin, but they present such strong analogies that they will be considered here. A good example of these modes of action is afforded by laryngismus stridulus, which is essentially a respiratory spasm. This may be excited by peripheral irritation, *e.g.*, laryngitis or exposure to wind, and also by certain emotional states, such as sobbing and passion.

Varieties.—Efferent fibres are distributed to glands, voluntary and involuntary muscular fibres, and hence any of these may be modified under abnormal reflex conditions; and as the secretory functions of the glands may be by these means excited or suspended, so there may be over-action (spasm) or suspension (paralysis) of the muscular functions.

1. **Modified Secretions.**—These may be the result of emotional states or of reflex irritation. The most striking examples of the latter are found in the disturbances of the functions of the kidney under certain conditions. Complete suppression of urine is a common result of severe injuries to the abdominal viscera, and sometimes occurs after such slight irritation as attends the passage of a catheter or after the performance of Holt's operation. Psychical states may profoundly influence secretion, as is shown by the occasional suppression of saliva as a result of fear and of the urine in hysteria, but more often they are attended by increased secretion, and give rise to an increased flow of pale urine of very low specific gravity, and sometimes even to diarrhoea.

2. **Spasm of Involuntary Muscle.**—This forms a large group of cases, far more purely reflex than those just considered, because in most of them cerebral influence may be neglected. Renal, biliary and intestinal colic belong to this class, and result from the irritation of mucous membrane by some abnormal substance. Vaginismus and œsophagismus sometimes arise in the same manner, and asthmatic attacks (due probably to spasm of the bronchial muscles) may result from the pressure of an aneurysm on the trachea, or from some abnormal condition of the nasal mucous membrane. Micturition has been known to be invariably excited by pressure over the bladder, and a fluid stool to be evacuated

after dressing a bed-sore. The occurrence of premature labour from some great nervous shock, and the constriction and dilatation of arterioles from emotion, afford illustrations of the influence of the brain upon unstriated muscular fibre.

3. Disorders of Voluntary Muscles.

—It is well known that epilepsy and the convulsions of infancy are occasionally due to peripheral irritation, such as the presence of ascarides in the intestine. The removal of the exciting cause in time may be sufficient to prevent the recurrence of any more attacks; but not infrequently the affected centres develop a habit of discharging, and convulsions afterwards appear to occur spontaneously. The reflex character of the fit is very clear in those rare cases in which there is an undoubted epilepto-genetic zone. The writer had under his care a boy of very nervous temperament; he patted him on the head to give him confidence, and there immediately ensued an epileptic attack, which inevitably followed irritation of that area of the scalp. Tremor of the hand and arm, closely simulating that of paralysis agitans, is sometimes caused by some constant irritation of the upper extremity, such, for instance, as the presence of a piece of glass in the palm of the hand. The removal of the source of irritation is soon followed by the relief and ultimate cure of the symptoms. It was formerly believed that reflex paralysis was comparatively frequent, but it is very probable that most of the cases described were really of organic origin. Nevertheless, it is impossible to doubt that instances of it sometimes occur, for how otherwise are such cases to be explained as sudden cure of a paraplegia following expulsion of ascarides, inability to pass water for some days after an operation on the anus, and the almost immediate return of power to a paretic arm after the extraction of a decayed wisdom tooth? Such cases are probably due to reflex inhibition of the spinal centres by some peripheral irritation; but another view refers them to the agency of the vasomotor nerves, which are reflexly irritated, and contract to such an extent in certain regions of the cord as to suspend its functions in those areas.

Closely allied to ordinary reflex action is the reflexion of pain from the source of irritation to some more distant region, as in cases of renal calculus, in which pain is referred to the testicle. In the same manner a carious tooth may excite neuralgia in some distant branch of the fifth nerve, and, it is said, even in the

cervico-brachial region. Irritation in the course of the fifth nerve sometimes induces an impairment of vision, consisting of a concentric contraction of the field of vision on the same side, and in some cases a slighter contraction of the opposite field. The removal of the exciting cause, which is often a decayed tooth, is generally followed by an improvement in the symptoms.

WM. GAY.

REFLEXES, SPINAL.—There are two varieties of spinal reflexes: (1) The superficial or skin reflexes; (2) the deep or so-called tendon reflexes.

Superficial Reflexes.—The following are the most important superficial reflexes, with the method of exciting them, the character of the movement induced, and the level of the cord on which the reaction depends.

The *plantar* reflex is obtained by tickling the sole of the foot, the result being usually a slight movement of the toes, and sometimes of the foot and leg. This reflex depends on the spinal centre corresponding to the first, second, and third sacral nerves.

The *gluteal* reflex is obtained by stimulating the skin of the buttock, the result being a contraction of the glutei muscles. This reflex takes place through the fourth and fifth lumbar nerves.

The *cremasteric* reflex is obtained by stimulating the skin of the upper and inner part of the thigh, the result being retraction of the testicle. This reflex takes place through the first and second lumbar nerves.

The *abdominal* reflex is obtained by stimulating the skin on the side of the abdomen from the ribs downwards, the result being a contraction of the abdominal muscles. This reflex takes place through the eighth, ninth, tenth, eleventh, and twelfth dorsal nerves.

The *epigastric* reflex is obtained by stimulating the skin of the chest over the fifth and sixth intercostal spaces, the result being a dimpling of the epigastrium on the side stimulated, from contraction of the upper part of the rectus abdominis. This reflex takes place through the fourth, fifth, sixth, and sometimes the seventh dorsal nerves.

The *scapular* reflex is obtained by stimulating the skin in the inter-scapular region, the result being contraction of the scapular muscles and of the posterior axillary fold. This reflex takes place through the lower two or three cervical and the upper two or three dorsal nerves.

These reflexes are liable to considerable

variations in health, sometimes being easily elicited, sometimes sluggish or absent. The reactions are obtained more readily in children than in adults, and variations may also be ascribed to other causes, such as obesity and temperament.

The condition of these skin reflexes is sometimes of service in determining the localization of spinal lesions or their vertical extent. Considerable caution, however, should be exercised in drawing inferences from the state of the cutaneous reflexes, and it is especially important to bear in mind that some or all may be absent even in health. The plantar reflex is probably less often wanting than the others, and on this account is of more importance.

The plantar reflex and the knee-jerk are not always similarly affected in disease. In hemiplegia, the former is usually diminished or absent on the paralysed side, whereas the latter is exaggerated. Again, in locomotor ataxia, the plantar reflex is often present, the knee-jerk being absent. The superficial reflexes are increased in those cases of paraplegia in which there is rigidity with exalted tendon reflexes; diminished or absent in most destructive affections of the grey matter of the cord, such as acute myelitis.

Deep or Tendon Reflexes.—Of the deep or so-called tendon reflexes, the *knee-jerk* or *patellar tendon reflex* requires special consideration. The knee-jerk depends on the integrity of the cord at the level of the second and third lumbar nerves, as well as on that of the motor and sensory nerves of the reflex arc. Into the arguments for and against the reflex nature of the knee-jerk it is unnecessary here to enter, but it is indisputable that a reflex action is concerned in its production, and that conditions which heighten or depress the reflex function of the spinal cord exert an identical influence upon the deep reflexes.

The knee-jerk, though liable to considerable variations, is probably always present in health. It is a moot point whether the reaction may be wanting in the normal individual.

It is well to bear in mind that absence of the knee-jerk may be the sole indication of structural changes in the nervous centres. It is sometimes important, therefore, to take special precautions to overcome involuntary effort before assuming that the reaction is really absent. By the ordinary method the patient is made to cross one leg over the other, and

then the tendon is percussed with the ulnar border of the right hand. Care should be taken that the leg hangs loosely. In a doubtful case, the patient should be seated on a high chair or table with the lower limbs bare, hanging freely, and off the ground. The tendon is then struck smartly just below the lower border of the patella, the patient at the same time being directed to interlock the semi-flexed digits of the hand into those of the other and to pull strongly. The knee-jerk is often difficult to obtain in very fat people, in highly muscular individuals, and in children. In the last named the reaction may often be obtained with more facility if the knee be semi-flexed and the sole allowed to rest on the observer's palm.

In children, in whom the tendon is short, it is often difficult to percuss smartly with the ulnar border of the right hand in the usual way, and hence a percussion hammer is useful. In adults, however, a specially constructed instrument is not essential. The knee-jerk varies much in health, sometimes being very feeble and obtained with difficulty, at other times brisk and elicited with great ease. However slight the knee-jerk may be, provided the reactions are equal on each side, it is not justifiable to infer the existence of an abnormal condition of the nervous centres; on the other hand it should be borne in mind that when the briskness in the knee-jerk is abnormal there is often inequality in the reactions and ankle- or knee-clonus is commonly present on one or both sides.

Loss of the Knee-jerk may occur in the following conditions:—(1) local injuries, such as fractured patella and rupture of the quadriceps femoris; (2) disease of the quadriceps, as in pseudo-hypertrophic paralysis; (3) disease of the anterior crural nerve, as in peripheral neuritis, such as commonly results from alcohol; (4) in lesions involving the anterior or posterior nerve-roots, such as meningitis or tumours, and more commonly in locomotor ataxia, in which the posterior root zones are involved; (5) in destructive affections of the grey matter of the cord involving the centre which presides over the knee-jerk, such as infantile paralysis and acute myelitis; (6) the reaction is often wanting in diphtheritic paralysis, the morbid anatomy of which is still uncertain, and sometimes absence of the knee-jerk occurs in diabetes, in disease of the cerebellum and immediately after an epileptic seizure.

Exaggeration of the Knee-jerk is pre-

sent in the following states:—(1) in the early stage of hemiplegia, from the withdrawal of the controlling cerebral influence; (2) in the later stages of hemiplegia when rigidity is present, from descending degeneration of the pyramidal tract; (3) in all diseases in which the lateral columns of the cord are affected, whether primarily or secondarily. Among such affections are primary lateral sclerosis, amyotrophic lateral sclerosis, disseminated sclerosis, and paraplegia from pressure; (4) occasionally in hysterical paraplegia, in typhoid fever, phthisis, and other debilitating conditions; sometimes immediately after an epileptic seizure, and frequently in persons under the influence of anæsthetics. Exaggeration of the knee-jerk is often, but not necessarily, associated with clonus.

Ankle- or foot-clonus is obtained by suddenly pointing the foot upwards so as to stretch the calf muscles, and then keeping up the pressure against the sole. The knee should be slightly flexed. The resulting clonic contractions are rhythmic and vary from six to nine per second. The level of the cord on which ankle clonus depends corresponds to the first three sacral nerves. A knee clonus may sometimes be obtained by forcibly pushing down the patella and then keeping up the pressure, the knee being extended. Another method is by pressing the left middle finger firmly against the upper edge of the patella, and percussing downwards with the fingers of the right hand. Clonus may occasionally be obtained in other muscles, such as the flexors and extensors of the wrist and sometimes in the lower jaw. Ankle-clonus never occurs in health; it is associated with an exaggerated degree of knee-jerk, and usually indicates structural changes in the lateral column of the cord. The phenomenon, however, may be obtained together with exaggerated knee-jerks, in such debilitating conditions as typhoid fever and phthisis, in persons under the influence of anæsthetics, after an epileptic seizure, in chronic rheumatoid arthritis, and probably in hysterical paraplegia. It is important to bear in mind, therefore, that ankle-clonus does not invariably indicate organic change in the cord.

Front Tap Contraction.—This name has been given by Dr. Gowers to a phenomenon often obtained when the knee-jerk is exaggerated, and which is a delicate test of increased irritability. The foot is placed at a right angle to the leg, and the muscles in the front of the

leg are tapped, the result being extension of the foot from contraction of the gastrocnemius. The front tap contraction does not always point to actual structural change in the cord, but its presence on one side only is of diagnostic significance. Muscular contractions are sometimes to be obtained in the upper limbs, on percussion of the tendons of the flexors and extensors of the wrist and of the tendons of the triceps. Percussion of the lower end of the radius (radial tap) may be followed by contraction of the biceps and supinator longus; and percussion of the lower end of the ulna by contraction of the triceps. These phenomena are usually well marked in hemiplegia with rigidity, but in health they are commonly feeble or wanting, and hence their diagnostic importance is limited.

W. B. HADDEN.

RELAPSING FEVER.—An acute specific disease characterised by a short febrile paroxysm ending in crisis, followed by a well-marked remission, and that by a relapse on or about the fourteenth day.

Symptoms.—After an interval of about five days following exposure to infection, the patient is suddenly seized with chilliness or a rigor accompanied by headache, pain in the back and limbs, and, especially in children, by nausea and vomiting. The temperature rises rapidly, reaching 103° or 105° F. or higher in the first twenty-four hours; the pulse also becomes rapid, thirst is extreme, and there is complete anorexia. The patient is restless rather than prostrate, and may not apply for treatment until the second or third day of his illness.

The symptoms of a fully developed attack are very pronounced. The face is flushed and the eyes suffused; the patient complains of severe headache, generally frontal, of pains, often described as rheumatics in the muscles and joints, and very commonly of giddiness, which may be so extreme that relief is only obtained when lying absolutely still in the recumbent posture. The mind is, as a rule, quite clear, though noisy delirium is occasionally observed towards the end of the paroxysm. Insomnia is frequently very persistent and distressing. There is no characteristic eruption; but in a small proportion of cases there may be a slight roseolar rash with subcuticular mottling. Petechiæ are very easily produced. Profuse perspiration is a marked symptom, and sudamina are of common occurrence. A peculiar musty odour often present is described as resembling

burning straw. The temperature is high, generally over 104° F., but is not uncommonly much higher, even 108° F.; these high temperatures, however, are not attended by grave nervous symptoms, and are not necessarily of bad prognosis; a slight remission occurs daily, generally in the morning. The pulse is full, bounding and rapid from 100 to 140; the degree of acceleration presenting, as a rule, a general correspondence with the height of the temperature. A hæmic murmur may be heard at the base of the heart. Respiration also is hurried, but the pulse-respiration ratio is generally maintained. The tongue is moist, large, indented by the teeth, and covered by a white fur, which, after the second day, tends to clear from the tip and edges, leaving a clean red surface. Appetite is completely destroyed, but thirst is constant and intense. Nausea is almost always present, and vomiting may be severe, the vomited matter being bile stained, or consisting only of glairy mucus tinged with bile; occasionally there is hæmatemesis. The spleen and liver are enlarged: the bowels tend to be loose. Jaundice has been frequently observed in some epidemics. Epistaxis is not uncommon, and may be profuse. The quantity of urine passed during the paroxysm varies in different cases, but it may not be diminished; the urea is increased, and bile pigments may be present if jaundice exists; in some cases albumen, with or without casts, is found.

The symptoms continue to increase in severity for from four to eleven days, when the crisis occurs and terminates the first paroxysm. This crisis, which in a large proportion of cases occurs on the seventh day, is characterised by a fall in the temperature more rapid and extensive than is observed in any other disease; the decline may be at first at the rate of 1.5° F. to 2° F. an hour, and may amount to as much as 12° , 13° , or even more in the course of twelve hours, so that the body-temperature becomes subnormal, the reading of 95° F. being frequently observed. Coincidentally the frequency of pulse also in most cases rapidly diminishes, decreasing from 140 or 150 to 80, 70, or even 60 or 50. The character of the pulse also alters, becoming compressible and dicrotic. This rapid defervescence is nearly always attended by some critical discharge, usually sweating, though metrorrhæia, epistaxis, diarrhœa, and vomiting may take its place. The critical urine is pale, and of low specific gravity; and the total urea is

at this period rather below than above the normal quality.

The patient now begins to improve, the temperature falls, the pulse regains tone, the urine after remaining pale and copious for two or three days again becomes natural; the appetite returns, the enlargement of the liver and spleen disappear, and the patient seems to be recovering from his disorder, whereas he is in reality passing through the period of *intermission*. The *relapse* occurs after seven days, or a day or two earlier or later; all the symptoms of the primary attack return with the suddenness which characterised its onset. The temperature again rises to 104° or 105° F., but seldom attains the highest point touched during the last day or two of the primary paroxysm. The duration of the relapse varies from a few hours to seven days or even longer, the average being three or four days; it usually terminates by crisis, which may be as well marked as that which ends the first paroxysm. There may be three, four, or even more relapses, but each tends to be shorter and slighter than its predecessor. During convalescence desquamation may occur, generally in small flakes.

An abortive form of relapsing fever has been described in which no relapse occurs. It should, however, be borne in mind that the relapse may be of very short duration, and thus escape observation unless carefully looked for. In the so-called bilious typhoid or congestive form of relapsing fever the symptoms assume the adynamic type—there is jaundice, marked enlargement of liver and spleen, epistaxis or metrostaxis, dry brown tongue, hiccough, diminished or suppressed secretion of urine, low delirium, and an imperfect crisis, which is not followed by a complete intermission, but by a fluctuating temperature.

Complications.—In the congestive form pneumonia is frequently present, but it may also occur in typical cases of relapsing fever and materially modify the course of the pyrexia. Among other respiratory complications may be mentioned laryngitis, bronchitis, and pleurisy; whilst phthisis is a not uncommon sequela. The enlargement of the spleen may be so extreme as to end in rupture, and is frequently accompanied by peritonitis; copious hæmatemesis may be observed. Diarrhœa occurs with varying frequency in different epidemics, but is only rarely so severe as to be a determining cause of death. The stools do not present any characteristic appear-

ances; they are not infrequently dark or black from altered blood. Albumen occurs in the urine more frequently in some epidemics than in others, and, when present in small quantity only, does not appear to have any specially unfavourable significance. The passage of highly concentrated albuminous urine, with perhaps tube casts, is a serious symptom, though recovery may occur after even total suppression. Hæmaturia is also a serious complication. The pains in the joints are occasionally accompanied by swelling. A frequent cause of death is sudden collapse, which may occur at the crisis, may be secondary to copious hæmorrhage, or associated with the hyperpyrexia, or be due to cardiac thrombosis. Purulent otorrhœa and parotitis are frequent complications. Paralysis of certain muscles, of the forearm, or of one upper or lower limb is sometimes observed, and in some epidemics post-febrile ophthalmia is frequent. Pregnant women attacked by this fever almost invariably abort; the child, if viable, is either stillborn or dies after a few hours, but in the majority of cases the mother recovers.

Diagnosis.—Relapsing fever is not always easy to distinguish until the fact of its epidemic prevalence has been recognized. It is to be diagnosed from typhus fever mainly by the sudden onset of the initial symptoms, the very rapid rise of temperature, the severity of the gastric symptoms, the absence of delirium, the presence of vertigo, of pains in the joints, of jaundice, and the absence of rash; later by the occurrence of the characteristic crisis, intermission, and relapse. The specific spirillum may be discovered by microscopical examination of the blood. Its mode of onset presents a striking contrast to that ordinarily observed in enteric fever, the temperature curve is throughout different, and the abdominal distension and pea-soup diarrhœa of enteric are not observed in relapsing fever. The congestive form of the latter disease, however, more nearly resembles the former, and has probably often been confounded with it. The same form of the disease, when complicated by marked jaundice, has been mistaken for yellow fever; the presence of enlargement of the spleen, the infrequency of albuminuria, and the great rapidity with which the temperature rises, taken together with the general circumstances of the locality as to epidemics, generally enable a diagnosis to be made. Relapsing

fever may be confounded with grave forms of remittent fever, but the character of the pyrexia and the course of the diseases are not the same; remittent fever only occurs in malarial regions, while relapsing fever is contracted from a previous case, and quinine, while exercising a notable controlling effect over the former, has little or no influence over the latter. Examination of the blood may reveal the characteristic pigment bodies or spirillum respectively. Cases of relapsing fever, where perspiration and pain and tenderness of the joints are marked symptoms, may be confounded with acute rheumatism, the discovery of a cardiac murmur may make the resemblance more exact, and the very high temperature may excite a fear of hyperpyrexia. In relapsing fever, however, nausea and vomiting are generally present, with enlargement of the spleen and liver; there is insomnia, but no delirium; and there is a decided tendency to hæmorrhage. The invasion of small-pox somewhat resembles that of relapsing fever, and, if both diseases are epidemic, it may be necessary to reserve a diagnosis until the fourth day. In every case, in fact, the general circumstances of the locality as to prevalence of epidemic disease within it must have great weight in forming a diagnosis in the early stage of the disease. Typhus and relapsing fevers, however, are liable to be epidemic contemporaneously.

Prognosis.—The mortality from relapsing fever is low, about 5 or 7 per cent., so that the prognosis is generally favourable. Unfavourable symptoms have already been mentioned; special reference need only here be made to the occurrence of convulsions or prostration and low delirium, of deep jaundice or suppression of urine, and of collapse. Pneumonia, which is, perhaps, the most frequent, is also the most fatal complication. A previous history of alcoholism is a most serious element in prognosis.

Morbid Anatomy.—The morbid appearances after death from relapsing fever are not characteristic; the spleen is very notably enlarged; there may be some surrounding peritonitis, and the capsule of the spleen may be perforated; the Malpighian bodies are enlarged, and the parenchyma presents numerous infarcts due to venous thrombosis. These at a later stage break down and form abscesses. The liver is enlarged from congestion; its epithelium is in the condition of cloudy swelling, and there may be small infarcts, which later give place

to minute abscesses. The kidneys are enlarged from congestion, the capsules may present ecchymoses, and the cortex infarcts; the epithelium is in the condition of cloudy swelling. The medulla ossium is softened, almost puriform, owing to proliferation and subsequent degeneration of the lymphoid cells. The number of white corpuscles in the blood also is increased. Cloudy swelling of the cardiac and voluntary muscles is followed by granular degeneration.

Etiology and Pathology.—Relapsing fever has been generally regarded, on very insufficient grounds, as standing in some intimate causal relation with famine. It is, however, a specific disorder, due to a specific contagium, and becomes epidemic under circumstances of the same nature as those which favour the epidemic prevalence of typhus fever—the accumulation of decomposing filth, and overcrowding of ill-ventilated rooms. It is independent of climate, is little influenced by weather, and has no relation to the soil. It is believed to be endemic in Ireland and in Hindustan, and it has occurred epidemically in England, Scotland, Russia, Scandinavia, Germany, Austria, Belgium, the Levantine littoral, and the islands of the Mediterranean, North Africa, and North America. It can be carried by travellers, and apparently by fomites, and can be transmitted by inoculation of the blood from man to man, and from man to monkeys.

A spirillum is found in the blood from a little before the first paroxysm, or at the least, shortly after its commencement, until shortly before the crisis, when it disappears; it is not discoverable during the remission until very shortly before the relapse commences, when it again appears in large numbers. From five to ten may be visible in a field (500 diam.), or they may be very much more numerous, and the number may vary from day to day. The spirillum is a homogeneous spiral filament, very thin, but in length it equals from one and a half to six times the breadth of a red blood-corpuscle. In fresh blood it is in constant motion of rotation, flexion and progression. The organism cannot survive for more than an hour at blood-heat; it has been found in certain cases at periodic dates, when, nevertheless, no pyrexia ensued, and it has not been found in certain cases during short febrile attacks lasting one day. For these and other reasons some prefer to believe that the spirillum is an epiphenomenon, and not the specific contagium

of the disease as is confidently affirmed by others.

Treatment.—Relapsing fever is very little influenced by treatment. The pyrexia is not even modified by the free administration of quinine, arsenic, salicylates or aconite, nor is the relapse postponed or rendered less severe. To relieve pain and procure sleep opium may be administered by the mouth, or preferably, morphine subcutaneously ($\frac{1}{4}$ grain every six hours). Light fluid food should be given from the beginning in small quantities at short intervals. Stimulants are well borne. The abdominal pain at the outset may be relieved by an emetic, and at a later stage persistent nausea may be treated by small doses of calomel (gr. $\frac{1}{4}$ — $\frac{1}{2}$ every two hours) or by subnitrate of bismuth. Strong aperients should be avoided. Diuretics have been recommended. Dr. Murchison's prescription was:—Pot. nitratis, \mathfrak{zj} — \mathfrak{zj} , acid. nitrici dil., \mathfrak{zj} , tinct. digitalis, \mathfrak{zss} , aq. ad $\mathfrak{z}\mathfrak{v}$, in divided doses during the twenty-four hours. Relief may be obtained by sponging the surface with tepid or cold water, or by cold affusions to the head.

DAWSON WILLIAMS.

RENAL CALCULUS AND GRAVEL.

—The solid constituents of the urine are liable to be deposited in the urinary passages under the following conditions:—

(1) When the solids are present in too large a quantity to be dissolved by the fluid of the urine. This may be due to an increase in the amount of the solids, or a decrease in the amount of the fluid. Under this heading, too, may be mentioned the condition in which an abnormal substance of sparing solubility, such as xanthine or cystine, is present in the urine.

(2) When the reaction of the urine necessary to maintain the solids in solution is altered, or when certain substances whose presence determines the solubility of other constituents of the urine, are decreased in quantity. There are certain constituents of the urine, the phosphates, which are insoluble in alkaline solutions, and are therefore precipitated, should the urine assume an alkaline reaction. Again, a hyper-acidity of the urine favours the precipitation of uric acid. But it is probable that slight changes of reaction determine the solution or precipitation of several constituents of the urine. Even the composition of such bodies may be readily altered so as to

produce from a soluble substance a comparatively insoluble one. Sir William Roberts has shown that this quadrurate of soda, a normal constituent of the urine, is readily changed into the bi-urate and uric acid by contact with water. Such a reaction goes on gradually in normal urine after its removal from the body, the uric acid being thrown down as a red precipitate. The bi-urate of soda, as soon as it is formed, is changed once more into quadrurate by the superphosphates contained in the urine, and is subjected again to decomposition by the water. These reactions go on until all the uric acid of the urine is at last deposited in the insoluble form. But although these reactions take place when the urine stands for some time, in ordinary conditions they are hindered or delayed. Sir William Roberts has observed that this hindrance is chiefly due to the presence of the saline matters and the pigments of the urine. The conditions, then, which accelerate the precipitation of uric acid, and lead to its concretion within the body, are, as summarised by Sir William Roberts—(a) high acidity, (b) poverty in salines, (c) low pigmentation, and (d) high percentage of uric acid.

There is also reason to believe that oxalic acid may be derived from uric acid in the body (*see* OXALURIA), and may then be deposited in the urinary passages as oxalate of lime.

(3) When substances of a colloidal nature are present which determine the precipitation around them of normal urinary ingredients. Dr. Vandyke Carter found that the nucleus of urinary calculi was composed of crystals of uric acid or of oxalate of lime, which had a globular shape, and which were not formed when these substances crystallized in ordinary conditions. Further, in such a nucleus a colloidal matrix could be detected. Mr. Rainey and Dr. Ord have shown, too, that the globular forms of crystals arise only when a colloid substance is present in the crystallizing solution. Thus, it appears that the presence in the urine of colloid matter, such as albumen or mucus, the result of catarrhal inflammation of the urinary passages, will determine the crystallization of uric acid or oxalate of lime in the spheroidal form, and thus lay the foundation for a calculus.

(4) When the pouching of the pelvis of the kidney is abnormally great. Sir William Roberts has suggested that such a condition, by favouring stagnation of

the urine, may be a cause of calculus formation in the kidney. This is very probable, but as yet lacks anatomical proof.

A renal calculus may consist of only one ingredient, such as uric acid, oxalate of lime, cystine, &c., or it may be composed of several primary deposits arranged in concentric layers, and representing different phases of calculous formation. Even when composed of only one ingredient, the arrangement in concentric layers may still be seen on section; or, on the other hand, the deposited matter may be arranged in lines radiating from the centre. But this primary calculous deposit is subject to the formation upon it of a secondary crust of phosphate matter, due to ammoniacal decomposition of the urine after the stone has been first formed. Thus, a stone may consist of a nucleus, a body and a crust. The nucleus may consist of globular crystals of the primary formation mixed with a colloidal matrix or of a mass of mucus alone, or again, of a small blood-clot or the eggs of *Bilharzia hæmatobia*. Renal calculus is more common in males, and slightly more frequent on the right than the left side. Probably, too, it is usually formed before middle age.

Small concretions which may be passed by the urethra are usually styled "gravel," while larger masses are known as "stones" or "calculi" proper.

VARIETIES OF RENAL CALCULI.—(1)

Uric Acid.—This is the most frequent constituent of renal calculi. It forms stones which vary in size from small pisiform bodies, which may be passed as gravel, to large masses which may completely fill the pelvis of the kidney. The larger stones are of variable shape, but have the general outline of a wedge in which the apex fits into an infundibulum of the kidney, and the base projects into the pelvis. Several of such wedges may, however, be joined together so as to form an irregular mass, which is embedded in the pouches of the renal pelvis. The uric-acid stone is reddish in colour, of moderate hardness, and it is prone to be formed in both kidneys. The immediate causes of its formation have been discussed above. The constitutional conditions in which it arises will be found described in the article upon URIC ACID DIATHESIS. The urine of a patient who is suffering from a renal calculus composed of uric acid is acid, and deposits urates and uric acid crystals on standing.

(2) **Urates.**—Stones composed entirely

of urates are rare, and are nearly always confined to children. They are usually small and soft. Deposits of urates are common in the straight tubes of the kidneys of newly born children. But urates are frequently found mixed with some other ingredient of a urinary calculus. The urine from kidneys containing urate calculi resembles that which is associated with concretions of uric acid.

(3) **Oxalate of Lime.**—Oxalate of lime may be passed in the form of gravel under conditions already described in the section on OXALURIA. It may also form a calculus, which may reach a very large size. Such a calculus is usually single. It is very hard, of a dark grey colour, and its surface is studded with numerous spiny projections, which render it extremely irritating to the tissues in contact with which it lies. The urine from which it is deposited is acid.

(4) **Phosphates.**—It is very rarely that calculi are found composed entirely of phosphates, although, as has already been stated, the secondary deposit on other stones is composed entirely of such salts. Calculi have been found, however, constituted entirely of calcic phosphate, and of this salt combined with ammonio-magnesian phosphate.

(5) **Carbonate of Lime.**—Calculi composed of this substance are very rare in man, but common in the horse. They may be voided in considerable numbers as gravel, but may attain a considerable size and be retained in the kidney.

(6) **Cystine.**—Cystine may also be passed as gravel, or may be retained in the pelvis of the kidney, forming a calculus. It forms a soft stone, yellowish in colour, changing to a greenish tint on exposure to the air. Its chemical characters will be found described in the article on URINE, EXAMINATION OF.

(7) **Xanthine.**

(8) **Fibrine or Blood.**

(9) **Indigo.**—Dr. Ord has described a specimen of renal calculus composed of indigo, derived, doubtless from indol, absorbed from the small intestine.

SYMPTOMS.—If a stone be so lodged in the pelvis of the kidney as to retain its position during the ordinary movements of the body, it may remain for years without causing any symptoms from which its presence may be suspected. This, however, is comparatively uncommon, and definite symptoms are produced, either by the movements of the stone or by the irritation which it sets up in the surrounding parts. Of these symptoms those due to the pas-

sage of the stone down the ureter on its way to the bladder, constituting an attack of renal colic or the gravel, will be first considered; and, secondly, those which arise when the stone remains in the pelvis of the kidney.

Renal Colic.—The symptoms produced by the attempt on the part of the stone to pass down the ureter, occur at an early stage, before the stone has attained any great size. After some strain, or exertion, or a sudden twist, or even in the midst of apparently perfect health, the patient is seized with sudden pain in one or other renal region, shooting in various directions, but mainly downwards in the course of the ureter, and along the inside of the thigh. The pain is most acute and well-nigh unbearable. During its continuance the patient is extremely restless, rolling from side to side in agony, no posture giving relief. He is faint, a cold sweat breaks out over the body. There are rigors and often severe vomiting and retching. The testicle on the side of the pain is retracted, and in some cases is congested, tender and swollen. There are frequent calls to micturate, but only small quantities of high-coloured, and often bloody urine are passed at a time, and the act of micturition is painful. The bowels may become distressingly distended. The nervous system, too, may be so disturbed as to give rise to delirium and even epileptic convulsions. After a little time a febrile movement is prone to set in, and may reach a high degree. These symptoms last for a variable time, sometimes for only an hour or two, sometimes for several days. In the most fortunate case, when the stone has finally passed from the ureter in the bladder, the patient is suddenly relieved of all his symptoms, and in a short time the stone which had caused his trouble is passed by the urethra.

Calculus in the Ureter.—Less fortunately, however, the stone may remain impacted in the ureter, usually at the narrowest part, where the ureter enters the bladder, and then, although the symptoms gradually subside, they do so very slowly. It may happen, too, that the opposite ureter has at some previous time been blocked by a stone and its kidney disabled; then impaction of a stone in the second ureter will give rise to obstructive suppression of urine, which, if not overcome, will kill the patient.

Calculus in the Renal Pelvis.—Of the symptoms which arise when the

stone remains in the pelvis of the kidney, *pain* is the most constant. This may vary in its character, but is usually a dull aching in the lumbar region, extending to the front of the abdomen and downwards along the course of the ureter to the testicle and the inside of the thigh. The pain is not always limited to one side, even though only one kidney be the seat of stone. The opposite kidney is frequently the seat of pain, and the pain has been known to be localized only in the healthy organ. Again, the pain may be reflected to far distant parts of the body, such as, in recorded cases, to the knee and sole of the foot. The pain is, it is said, the most severe when the stone is composed of oxalate of lime or covered by phosphates. The pain is increased by exercise, most of all by riding, least by walking. In certain postures, too, which the patient learns for himself, and which are usually those in which the kidney is relieved from pressure by the surrounding parts, the pain is lessened. Sometimes, but rarely, the pain instead of being a mere aching, is extremely severe, and neuralgic in character. As a rule there is tenderness on pressure over the seat of the stone, and in some cases a slight fullness can be detected in the region of the kidney. Yet, on the other hand, instances have been known in which the pain was relieved by pressure. Where more than one stone is present in the pelvis of a kidney, a sensation of grating may be perceived by the patient, and may even be obvious to the physician on palpation.

Hæmaturia is an important symptom of stone in the kidney. It is very frequently present, and though seldom profuse, is prone to be constant. Its conditions of origin are important. It is often induced by movement, and generally by those conditions which increase or provoke pain in the kidney, and it subsides or diminishes when the patient remains at rest. Hence the urine passed in the early morning is free from it, whereas, as Dr. Dickinson has remarked, in the case of malignant growths, the night's rest in the supine position favours the accumulation of blood, and causes the hæmaturia to be well marked in the morning.

The testicle is not infrequently persistently retracted and swollen, on the same side as the renal calculus, and may be the seat of neuralgic pain. Bladder symptoms, especially irritation and frequent micturition, may be so pronounced

as to call off the attention from the kidney, which is the real seat of the trouble.

Digestive disturbances of all kinds are common accompaniments of renal calculus. Flatulence and acid dyspepsia are the most common, but severe vomiting and retching and gastrodynia may also be met with.

A frequent result of the irritation of the calculus is pyelitis, with, as its consequence, the discharge of pus and tailed epithelium with the urine. Its symptoms have already been detailed in the article on PYELITIS.

Dr. Dickinson has shown that there is some reason to believe that mental derangements are to be counted amongst the other conditions produced by renal calculus.

RESULTS.—The stone may, as has already been noted, remain quiescent from the earliest period of its formation. The symptoms which have been described, may, after a time, subside, and never again, or only after a considerable interval, trouble the patient. On the other hand, the constant or frequently recurring pain may wear him out. The irritation of the stone may produce not only pyelitis and pyonephrosis, but may cause constant congestion of the kidney, shown by the presence of albumen and casts in the urine, and as the result of this there may arise overgrowth of the interstitial tissue of the kidney with, finally, fibroid contraction and atrophy. Similar atrophy occurs when the ureter has been permanently blocked by a calculus. It is obvious that thus the kidney is disabled, and if a similar accident should befall the opposite organ, death must result from obstructive suppression of urine. But the irritation may spread beyond the limits of the kidney and cause perinephritis. Then by a process of ulceration, as detailed in the article on PERINEPHRITIS, the stone may get outside the confines of the kidney, and be discharged externally, with the pus from a perinephritic abscess. An abscess of the kidney may, by perforating the intestine or the peritoneum, be the means of conveying the stone into the intestine or the peritoneal cavity. If into the latter situation, the result is almost invariably fatal.

DIAGNOSIS.—The direction of the pain, the frequency of micturition, and the non-supervention of jaundice, will suffice to easily distinguish an attack of renal from one of hepatic colic. It is only necessary to mention the possibility of

the intestinal distension causing a mistake to arise between intestinal and renal colic.

Symptoms similar to those of renal colic may be produced in patients who are the subjects of the uric acid diathesis, by the passage of urine which is highly acid, or which already contains crystals of uric acid or oxalate of lime. But in such a case, the pain is not so acute as in the true renal colic, is not so paroxysmal, and is not accompanied by retching or vomiting, and is easily relieved by a few doses of alkalies.

The hæmaturia of malignant disease may cause it to be mistaken for renal calculus. But the hæmorrhage in calculus, as stated above, is always lessened by rest, and is not so copious, and there is no appreciable tumour to be felt. Moreover, while the urine from a case of calculus may contain crystals of the same nature as the stone, it would never contain portions of cancerous tumour, such as may appear in cases of malignant disease.

The diagnosis of stone in the kidney from tubercle of the kidney is sometimes difficult. In both there may be pain, tenderness, slight fulness in the loins, frequent and painful micturition, and a discharge of pus in the urine. But in tubercle the pain is never so great as it can be at times in cases of stone, and hæmaturia, too, is somewhat rare in tubercle, but common in stone. The urine in cases of tubercle often contains more granular debris than is the case in calculous pyelitis, and it may contain the tubercle bacillus, though this is difficult of detection in the urine. In tubercle, also, there may be signs of the same disease elsewhere in the body, and the evening temperature may be persistently high, which would be a very rare phenomenon in calculous pyelitis.

TREATMENT.—When suffering from an attack of renal colic, the patient should first be placed in a warm bath for a time and then removed to bed. He should have copious warm drinks containing bicarbonate of potash, and warm fomentations or poultices should be applied to the loins and the front of the abdomen. A large warm enema often assists in relieving the pain, but morphine should always be given (subcutaneously) in somewhat large doses, since such patients commonly bear it well during their paroxysm. Belladonna and hyoscyamus given internally are also of use. It occasionally happens that change of posture, even, in

one instance, the inversion of the patient, suffices to displace the stone and cause it to fall back into the pelvis of the kidney. The course of the stone along the ureter may also be assisted by massage of the abdomen in the direction of the ureter.

During the intervals of renal colic, care should be taken to avoid all sudden shocks, or violent exercise, such as have been found to bring on paroxysms of pain or hæmaturia. The nature of the stone having possibly been determined by an examination of the urine, a due arrangement of diet and habits, and the washing out of the kidney by copious libations of Salutaris or other pure water, and the administration of alkaline remedies, such as the citrate of potash, acetate of potash or citrate of lithia, will prevent further increase in the size of the stone and so assist in obtaining its quiescence in the renal pelvis. Symptoms must be relieved as they arise, pain by rest, morphine and warm applications; hæmorrhage and pyelitis, by the remedies detailed in the articles upon those affections. Attention must be paid to the general health of the patient and this sustained by tonics, change of air, &c. A visit to the Spas of Vichy, Carlsbad or Ems, with a course of the waters at those places, is often beneficial. Attempts have been made to dissolve the calculi as they lie in the kidney, by altering the reaction of the urine by means of drugs. In the case of phosphatic renal calculi this is impossible. For the solvent treatment of uric acid calculi, Sir William Roberts recommends the use of the citrate of potash in large doses every three hours. The drug should be pure, and is best given in a mixture having the following formula:—Pot. bicarb. $\mathfrak{z}\text{xij}$, acid. citric. $\mathfrak{z}\text{viij}$, gr. xxiv, aquam ad $\mathfrak{z}\text{xij}$. Of this one ounce, which contains one drachm of the citrate, should be given as a dose, mixed with 3 or 4 ounces of water. If, however, the urine become ammoniacal, the treatment should at once be suspended.

If the symptoms persist and the patient's health is being undermined by constant pain, and discharge of pus, or he is prevented from following his occupation by the distress thereby induced, surgical means must be employed to relieve him of his trouble. The progress of modern surgery has removed many of the risks attendant upon operations upon the kidneys. The operation most generally called for is nephro-lithotomy, by

which the stone is removed through a lumbar incision. Nephrotomy, or mere incision of the kidney, may be called for to drain a pyonephrosis or inflamed renal pelvis, without removal of the stone, when the latter is firmly fixed or the kidney is greatly disorganized. Nephrectomy, or the removal of the whole kidney, for stone, is a dangerous operation, and one which can only be advised when the patient's life is in danger and all other methods of relieving pain have failed.

ROBERT MAGUIRE.

RETROPHARYNGEAL ABSCESS—Inflammation terminating in suppuration in the connective tissue between the spinal column and the pharynx.

Symptoms.—In idiopathic cases the symptoms come on rapidly, dysphagia being the first to be noticed; there is acute pain, rapid pulse and fever. As the abscess enlarges, difficulty in breathing occurs and the respiration is stertorous, and there is usually a croupy cough. When secondary to disease of the cervical vertebræ, the affection is preceded by stiffness of the neck and deformity of the cervical vertebræ, the symptoms come on more gradually, and there may be an entire absence of fever. On examination, a projection of the posterior wall of the pharynx may be found, and on palpation this may be felt to be elastic and fluctuating. Externally, a swelling may be seen and felt at the angle of the lower jaw. If it can be used, the laryngoscope is the best means of ascertaining the size and situation of the abscess.

Diagnosis.—The disease may be confounded with diphtheria, but the result of an objective examination should suffice to clear up any doubt.

Prognosis.—This must in all cases be guarded, as death may occur from complete closure of the glottis by pressure, or from the occurrence of œdema, or the abscess may burst during sleep and the contents enter the larynx and suffocate the patient. In secondary abscesses the prognosis is very grave on account of the nature of the diseases which cause them.

Pathology.—Lymphadenitis as a result of extension of inflammation from the mucous membrane seems to be the cause of the abscess, two lymphatic glands at the level of the second and third cervical vertebræ being the starting-point of the suppuration.

Ætiology.—This is especially a disease

of infancy and childhood. It may be idiopathic, being met with in connection with oral and pharyngeal catarrh, or it may be caused by caries of the spine, or occur as a result of measles, scarlet fever and septicæmic conditions.

Treatment.—The abscess should be opened as soon as possible, and the head held forward to prevent the pus entering the larynx. The after-treatment should be of a supporting nature.

F. DE HAVILLAND HALL.

RHEUMATIC ARTHRITIS (Chronic Rheumatoid Arthritis; Osteo-arthritis; Rheumatic Gout; Nodular Rheumatism; Arthritis Deformans).—A joint disease of chronic course, characterized by inflammatory overgrowth of the articular cartilages and synovial membrane, with destruction of those parts of the cartilages subject to intra-articular pressure, and progressive deformity.

Symptoms and Progress.—The disease begins—often not long after the subsidence of an attack of ordinary rheumatism—with painful swelling, redness and stiffness of one or more of the smaller joints, usually of the hands. The acute symptoms subside after a while, but generally recur in the same joints before these have quite recovered their normal size and shape; at the same time other joints are apt to be affected in the same way. Thus the articular pain and swelling tend to recur, at progressively shorter intervals, in all the joints previously attacked, and, upon each recurrence, to invade other articulations which had previously escaped. While the exacerbations become somewhat less acute in character, the intervals between them become so shortened as to be practically absent, and ultimately every joint in the body exhibits, more or less, the effects of the disease. The joints are swollen, nodulated, laterally expanded, stiffened, and distorted; and some are never wholly free from pain. On movement, creaking may be heard and felt. In proportion as they become fixed, the muscles in connection with them waste, functional activity of all kinds is increasingly impaired, and, though the mind may be unaffected, bodily suffering increases. In extreme cases, the patient presents the appearance of a pallid, helpless, pain-worn, deformed and bed-ridden cripple, always sensitive to cold and painfully appreciative of changeable and inclement weather.

The disease may possibly be arrested in its early stages by appropriate and energetic treatment, but later on it is practically incurable; and, though very rarely fatal *per se*, it necessarily predisposes the subject to risks of serious complications, especially to those of a pulmonary nature.

Pathology.—Anatomically examined, the affected joints in the early stage of the malady exhibit enlargement and general distension by an excessive effusion of serum. The synovial membrane is thickened and hyperæmic, its fringes becoming hypertrophied and developing lumpy and pyriform excrescences, at first fibrous and later cartilaginous in texture. The articular cartilages likewise increase by cell-enlargement and proliferation. In their central portions, where the intra-articular pressure is severe and constant, the cavities which contain the proliferating cells break into one another, so as to form vertical linear tubules, opening on to the free surface and discharging their cell-contents within the synovial cavity. Hence the articular cartilages, owing to this vertical striation, appear velvety and pitted. By an extension of the same process they become partially eroded, until the osseous surfaces are exposed, and these finally become, by mutual attrition, worn to an ivory-like smoothness. Coincidentally, at the periphery of the joint, and where freed from pressure, this hypertrophy of the cartilages and synovial fringes leads to a lateral expansion of the joint surfaces. The effusion is absorbed, and the joint becomes dry and creaking; the irregular ecchondroses become more or less separated from their original site of growth, form new attachments, and ossify. Thus are gradually produced the lateral expansion, the irregular distortion and nodulation, the rigidity, the dislocations, and the (usually false) ankyloses which are so characteristic of marked rheumatic arthritis. The sterno-clavicular joints usually appear to be only simply enlarged; the temporo-maxillary exhibit enlargement in front of the ear, often with some distortion of the jaw and chin. The chief symptom in connection with the vertebral column is rigidity. In the hip-joint the disease may simulate simple dislocation, Charcot's disease, and intra-capsular fracture.

Considerable bilateral symmetry is often observable in the distribution of the joint affections of rheumatic arthritis.

Etiology.—The tendency to rheumatic arthritis is frequently hereditary. The

disease is common in those who have at some time previously suffered from other forms of rheumatism—with which it clearly has an intimate pathological connection. All depressing and debilitating influences predispose to it, and women at the climacteric age are frequent sufferers. Although mainly a disease of the declining period of life, young persons are not exempt from it, and cases of its occurrence in infancy have been recorded.

Treatment.—The general treatment of rheumatic arthritis is essentially that proper to other forms of rheumatism. Cod-liver oil, iron and arsenic are always useful, together with warm woollen clothing, careful attention to the general health and to the hygiene of the skin, free exposure to direct sunshine, and residence in a warm, dry, bracing climate whenever this is possible. Tincture of iodine, in doses of 5 to 10 minims thrice daily, occasionally proves of service (*see also* RHEUMATISM, CHRONIC).

Local treatment is important, and may be of great service in arresting the disease in its early stages. The most useful measures are repeated hot fomentations of the affected joints, followed by painting with equal parts of the liniment and tincture of iodine, continued to the verge of blistering; the frequent inunction of iodine or of mercurial preparations, of plain oil, or of lanoline and of sulphur; burying the joint thrice daily for two or three hours at a time in a sand bath at 140° to 150° F., friction, massage and galvanism.

Courses of anti-rheumatic thermal baths in England or on the Continent, and prolonged tropical or sub-tropical sea-voyages, are of service. Whatever be the measures adopted, they must be followed out with continuous perseverance.

In the advanced forms of the disease treatment can be little more than palliative; yet much can often be done to allay pain and discomfort, to improve the general health, and to prevent the further progress of the malady by such means as are indicated above, and under RHEUMATISM, CHRONIC.

C. E. SHELLY.

RHEUMATISM.—A general disease affecting chiefly the joints, the fibrous structures and the muscles of the body, the acute form being marked by fever, profuse sour-smelling sweats, and shifting inflammation of the joints and fibrous textures.

RHEUMATISM, ACUTE (Rheumatic Fever).—**SYMPTOMS AND COURSE.**—The disease may arise suddenly, but usually a few days of malaise, with stiffness and intermittent aching in the joints and limbs, a sense of chilliness, and some sore throat or tonsillitis precede the onset of marked pyrexia. By this time one or more of the larger joints (ankles, wrists, knees or elbows) are found to be swollen, hot, extremely tender, more or less painful and somewhat reddened. The patient is prostrate and the cheeks are flushed; the tongue is foul, furred and moist; the pulse frequent, weak and soft. There is anorexia, with great thirst, and some irregularity of the bowels, the motions being commonly offensive; the urine is febrile and excessively acid; and the skin is bathed in an abundant, sour-smelling sweat, frequently attended with a development of sudamina and miliaria. While the general febrile condition persists with only slight and occasional diminutions of its intensity, in the course of a day or two, or even within a few hours, the inflammation commonly rapidly subsides in the joints first attacked, leaving them merely weak, feeble and slightly swollen: but coincidentally with this local improvement other joints become similarly affected with the characteristic pain and swelling, which, again, subside as yet other articulations are attacked in their turn, the joint symptoms thus irregularly shifting hither and thither, and, not rarely, again affecting joints which had apparently recovered. This state of things usually lasts for about a fortnight, but may continue indefinitely, until, with a gradual subsidence of the local and general inflammatory symptoms, the patient, much weakened and emaciated, begins a somewhat tedious convalescence, or the disease declines into a chronic form. In either case a *relapse*, in which all the more acute symptoms may again appear, is very apt to interrupt the course of what promised to be a satisfactory recovery.

COMPLICATIONS.—Simple acute rheumatism, as such, is never fatal, but the malady is apt to be attended by complications, of which those involving the heart and the respiratory organs respectively and an excessive degree of fever are especially dangerous. Inflammation of the sclerotic and of the conjunctiva—"rheumatic ophthalmia"—sometimes occurs during, or subsequently to, the acute articular form of the disease.

Cardiac Disease.—This, in the form

of either pericarditis or endocarditis, occurs in about one-half of all rheumatic cases. The affections commonly develop quite early in the course of an acute attack, but may do so at any time. Youth, and childhood especially, is prone to these complications, which are comparatively rare in persons over thirty. The liability to endocarditis increases directly in proportion to the severity of the attack, and women suffer more frequently than men. Changes in the myocardium are probably present in all severe cases, and are possibly the cause of the functional derangements, such as palpitation and distress, which may arise in the course of, or as a sequence of, acute rheumatism.

Diseases of the *Respiratory Organs*—pleuro-pneumonia, pleuritis, pneumonia, bronchitis, pulmonary congestion—not rarely complicate the primary disease and add greatly to its fatality; they usually arise during the later period of the malady.

Hyperpyrexia is a rare, but very fatal, complication, and may occur at any period. Its onset is indicated by a flushed face and excited manner, passing into delirium, subsidence of the articular pain and swelling, cessation of the perspiration, and a body temperature of over 103°F ., which continues rapidly to rise, in fatal cases reaching 108° or even 112° . The condition is generally accompanied by symptoms of acute cerebral excitement.

Rheumatic Nodules.—Attention has of late years been directed to the frequent occurrence as a complication of rheumatism, of small subcutaneous nodules in connection with fibrous structures, such as tendons, the deep fasciæ and the pericranium.

The most common situations of the nodules are on the limbs, the fingers, the backs of the hands, wrists and elbows, the trochanters, the margins of the patellæ, and the malleoli. They may also occur on the pericranium, pinna of the ear, spines of the vertebræ and scapular spines, the crista illi, and the ischial tuberosities. The skin over them is usually normal, but may be a little reddened. They vary in size from that of a pin's head to an almond, are movable on the underlying structures, and are not, as a rule, either painful or tender, but in some cases both pain and tenderness have been noted, the latter more often than the former. The nodules are arranged either singly or in groups, their distribution being often absolutely symmetrical; they can generally be more

easily felt than seen. They may appear in a crop or singly, and may, after their discovery, increase in size or remain unaltered; after attaining their maximum they may continue unchanged for a few days only, or for months (fourteen months in one case), but, as a rule, they ultimately either diminish in size or disappear completely, though after diminishing in size they may again enlarge.

The nodules have been observed much more frequently in children than in adults, and, as regards sex, girls are observed to be affected far oftener than boys.

They are not necessarily associated with pyrexia, but whenever present in a child they constitute an undoubted evidence of rheumatism, but similar nodules have been observed in adults in whom no rheumatic history could be obtained.

In children the nodules have, in nearly all cases, been present in association with endocarditis, often of a serious and progressive character; pericarditis and pericardial adhesion have also been noted, whilst chorea and other rheumatic manifestations have naturally been present in a large number of recorded cases.

Microscopically, the growths are found to consist of wavy strands of fibrous tissue, with cells of various shapes, caudate, spindle-shaped and nucleated, and numerous blood-vessels.

The nodules require no treatment, but their presence adds somewhat to the gravity of the prognosis in rheumatism in children, owing to their frequent association with endocardial changes.

The more acute *nervous symptoms* observed in some cases are usually attendant on hyperpyrexia. But *chorea*, a not uncommon sequel, may also arise during an attack of rheumatism. Rheumatism is frequently associated with *erythema* and *erythema nodosum*, and occasionally with remarkable purpuric eruptions—*purpura vel peliosis rheumatica*. The disease also occurs in the course of, or as a sequel of, *scarlatina*. *Glycosuria* is sometimes developed during an attack of acute rheumatism.

Cases of *Sub-acute Rheumatism* present symptoms differing from those of the acute disease mainly in their greater mildness and their more varied grouping, but they often display a persistent tendency to the recurrence of the joint affection in a sub-acute form.

PATHOLOGY.—The precise cause and origin of rheumatism is unknown. Various theories exist which explain the disease as being due to an excessive pro-

duction or accumulation of *lactic acid* within the system; the influence of *chill*, either causing retention of lactic acid or evoking trophic and vaso-motor neuroses and arthropathies; the action of *micrococci*, producing an endocarditis to which the joint symptoms are secondary; the presence of a specific vegetable microbe, *zymotosis translucens*; and a miasmatic, malarial poison. The blood in acute rheumatism contains an excess of fibrin, but no abnormal principle has been discovered in it.

The chief tissue changes observable in fatal cases are, in the affected joints, swelling and hyperemia of the synovial membrane and of the neighbouring tendons, ligaments, &c., with patches of swelling, softening, and even of erosion (due to rapid cell-proliferation and consequent vertical striation) in the articular cartilages. The joint cavity is occupied by an alkaline, albuminous fluid, occasionally turbid with flakes of lymph, and but rarely purulent. The various complications previously noted would be responsible for further pathological changes, including the granular degeneration, fluid blood, and liability to rapid decomposition which are noted in cases of hyperpyrexia.

ÆTIOLOGY.—The disease is commonest in young persons from sixteen to twenty-five years of age, as a first attack, but a liability to the disease is increased by a previous attack and by the influence of heredity, which is traceable in over 25 per cent of all cases. Social position and occupation, as influencing exposure, poverty and exhaustion, may act as potent predisposing causes. The influence of sex, as such, is not marked.

DIAGNOSIS in completely developed cases of acute rheumatism is easy; it may be for some time uncertain during the stage of invasion. The acute disease for which it is perhaps most often mistaken is *Pyæmia*, secondary to acute osteo-myelitis; but in pyæmia the joint affection is persistent and may proceed to suppuration, the fever is notably remittent, the sweating is neither continuous nor sour-smelling, and the subsequent history of the case will still more distinctly declare its nature (*see SEPTIC DISEASES*).

Gout is distinguished by its more sudden invasion, by its preference for the smaller joints, by the special characteristics of the joint symptoms, by the previous history, and by the presence of uric acid in the blood.

Simple *Synovitis*, whether traumatic or constitutional in origin, is persistent,

rarely multiple, never migratory, and owns a definite cause.

Rheumatoid Arthritis exhibits the characteristic deformity, with a different ætiology and method of progress.

In *Gonorrhæal Rheumatism* the joint trouble is more persistent, especially in the knees, and is associated with the specific urethral discharge or with a history of recent gonorrhœa.

Glanders may resemble rheumatism in its early stage, but the disease soon displays marked differential characteristics.

It must not be forgotten that either the pyrexia or the joint symptoms, or both, may be very slightly marked, and even completely absent, in some cases of rheumatism, especially those occurring in young children, and yet such cases are not the less liable to develop cardiac complications.

TREATMENT is directed to securing general and local rest, the avoidance of any check to the cutaneous secretion, the relief of acute symptoms, the prevention of complications and the correction of their effects.

The patient must be placed on a firm, narrow bed, protected from draughts, in a warm, well-ventilated room, and should lie between the blankets, clothed in a long flannel bedgown opening all down the front, the sleeves being slit open along the outer seam and re-fastened by tapes fixed at suitable intervals. This gown and the blankets should be changed as frequently as the patient's condition will admit. It is well to wrap *all* the larger joints, whether inflamed or not, in a thick layer of cotton-wool, kept in place by the firm and even application of a many-tailed bandage of soft and porous texture, and this cotton-wool should be renewed occasionally, until its employment is gradually relinquished during the progress of convalescence. The joints should be lightly sponged with warm soap and water before the cotton-wool is applied. When pain is severe, the affected joints may be encased in a single thickness of lint, saturated with a weak alkaline lotion containing tinct. opii \mathfrak{zss} , extr. belladon. gr. xx, chloral hydrat. gr. ij, or lin. aconiti \mathfrak{zss} , to the fluid ounce, covered with oiled silk and enclosed in cotton-wool as above. The whole surface may be sponged piecemeal with tepid soap and water, and immediately dried by another warm sponge or soft cloth, night and morning.

The *Diet* must be fluid, sustaining and unstimulating. Milk, diluted if necessary with an alkaline mineral water, may

be given freely; toast and water, barley-water, and water—plain or aerated—may be taken (like the milk, by sips) to quench thirst; small quantities of weak chicken-broth are allowable, and “egg lemonade” (the whites of two eggs, the juice of half a lemon, and a little glycerin, mixed with half a tumbler of water, but not beaten to a froth) is both refreshing and nourishing; but beef-tea and strong soups are undesirable, except when their stimulating qualities are specially required. All food must be given at short and regular intervals, and stimulants may be indicated by great prostration and in the event of serious cardiac or respiratory complications. As convalescence becomes established, small quantities of fish, custard, fowl and the like may be gradually added to the dietary, but butchers’ meat, if taken within a week after the complete subsidence of all rheumatic pain, is almost certain to provoke a recrudescence of the more acute symptoms. Ale, stout and the stronger wines should be forbidden for a considerably longer period.

If seen at the outset, and before the disease has definitely declared itself, the administration of a calomel purge, and tr. aconiti mj in a little aq. camph. every hour for the first twenty-four hours, may do much to lessen discomfort and even to abate the severity of later symptoms. The most generally successful treatment of acute rheumatism consists in the administration of sodium salicylate (gr. xx for an adult) with pot. bicarb. (gr. xv) or of salicin (gr. xv in wafer-paper) or of salicylic acid (gr. xx in milk, or with liq. ammon. acet.) every two or three hours until the pain is subdued and the temperature becomes normal, after which the remedy must be continued in diminished doses or at longer intervals for several days—otherwise the acute symptoms recur. Or a rather smaller dose of the salicylate may usefully be combined with 10, 15 or 20 grains of citrate of potash, especially if the urine be excessively acid. If each dose be guarded by about 5 minims of tinct. nucis vom. the effects known as “salicysm” (deafness, ringing in the ears, sickness, cardiac depression and delirium) are less frequently observed. These symptoms, however, now that salicylic acid can be obtained free from impurities, are rarely met with. When the salicylates disagree, full doses of the alkaline citrates, bicarbonates or tartrates may be given at short intervals until the urine becomes distinctly alkaline, after

which the same medicine is to be given in such doses and so often as will just serve to maintain the alkalinity of this secretion. Or quinine may be given, alone or with alkalis, in doses of 3 to 5 grains every four hours. Calomel occasionally and in moderate doses may be given with advantage during the administration of the salicylates.

Opium, in the form of pulv. ipecac. co., is often useful as an anodyne hypnotic—when not contra-indicated by respiratory or renal complications.

Antipyrine, in doses of 15 or 20 grains every few hours, will sometimes relieve acute symptoms when other measures have failed.

The salicylates and the alkalis usually need to be given well on into convalescence, and only gradually withdrawn as a more tonic medication is adopted. But as rheumatic pain gives place to mere aching, quinine becomes of marked value, and—especially if the urine be found of low specific gravity—iron is also indicated; in this stage also the tincture of bryonia dioica, in 3 to 5 minim doses, is often serviceable. A regular and sufficient action of the bowels must be maintained throughout the illness. If rheumatic joints continue stiff, swollen and weak, they may be lightly blistered, or painted with iodine, and shampooed, while guaiacum and potassic iodide are given internally. Change of air, especially to a warm, dry climate, does much towards completing the cure, but the convalescent must be careful in respect of clothing and of exposure. His underclothing, from throat to wrists and ankles, and his socks, must be woollen, and changed at least once a week, and he should be warned how greatly one attack of rheumatism predisposes to a second.

The prevention, detection and treatment of *Complications* is most important. The heart must be carefully examined at the onset, and its condition observed daily throughout the course of the disease, while care is taken to avoid all needless and too frequent exposure of the chest wall. Should signs of inflammation of the heart or pericardium be detected, the treatment proper to these conditions, including a succession of flying blisters, must be promptly adopted. The greatest caution should be observed in allowing such patients to leave their beds; and, indeed, there can be little doubt that, if all cases of acute rheumatism, however slight, were kept in bed for at least four to six weeks, the later

cardiac symptoms would be much more rarely developed, or would at least be much mitigated in severity, as they would also be more certainly detected in their initial stages.

The various respiratory complications demand their appropriate treatment, and, like those referable to the heart, often call for free stimulation.

Hyperpyrexia when slight, may be treated by frequent sponging of the whole surface with cold water; in its more acute form it is best combated by placing the patient in a bath at a temperature of about 98° F., and cooling this down by the addition of cold water to about 60° or 70°. When the patient's rectal temperature is reduced to 99°, or should he begin to shiver, he must be at once dried, removed from the bath, replaced in bed and kept lightly covered. The cold bath, or the cold pack in milder cases, may be repeated if the temperature again rise rapidly or to an abnormal height. The glycosuria commonly yields to the administration of salicylates.

Rheumatism occurring in gouty subjects must be treated with due regard to the dominant diathesis. Potassic iodide in combination with ammoniac chloride and salicylate of potash is often useful; and colchicum may be of service in relieving pain.

C. E. SHELLY.

RHEUMATISM, CHRONIC.—

This affection is intimately associated with the acute form of the disease, being sometimes developed either subsequently to it, or as its final stage, and commonly appearing amongst those who inherit the rheumatic diathesis.

Chronic rheumatism is, however, a disease more of middle than of early life, but it is apt to be provoked by the same causes—hardship, exposure, damp, cold, &c.—as those which predispose to the acute form; and its progress is marked by anatomical appearances and pathological changes which do not differ from those observable in ordinary sub-acute articular rheumatism, save in those extreme examples of the chronic form which merge into, and are practically indistinguishable from, rheumatoid or chronic osteo-arthritis.

Symptoms.—The salient features of chronic rheumatism are associated with the joints, and comprise essentially two symptoms, viz., *stiffness*—accompanied with a sense of dryness and with audible creaking on movement—and *pain*; the latter is mostly severe, heavy and wearing in character, and often involves the

contiguous muscular and bony structures of the limb. Both symptoms are generally relieved by local friction and by free and persevering movement within moderate limits; are aggravated by over-exertion, as well as in cold, damp and sunless weather; and are very apt to be excited by local strain or injury. Although prone to shift from joint to joint, and in time to implicate a gradually increasing number of articulations, the symptoms are more persistent, and more often recur in the joints first attacked than is the case in acute rheumatism.

Beyond the effects of pain and of the impediment to exercise and locomotion, the general health is not appreciably impaired in the milder class of cases. But in those of a more severe type, the frequent recurrence of pain and swelling in certain joints—particularly in those of the hands—becomes associated with a gradually increasing enlargement and deformity of those structures. As the disease progresses, other joints, great and small, become successively invaded; the exacerbations of local pain and swelling recur at still shorter intervals, until at last they are practically continuous, though then often less acute. The general health suffers in proportion and the several joints may become irregularly swollen, dislocated, ankylosed and variously distorted to an extreme degree. It is in these, the more severe cases, that cardiac complications are most usually met with; they are commonly the sequel of an endocarditis due to an attack of acute rheumatism which has preceded, or occurred in the course of, the chronic malady.

In all its forms the disease is very persistent, except under the most favourable conditions, difficult to arrest, and extremely prone to recur on very slight provocation.

Diagnosis.—The aching and swelling associated with varicose veins of the leg and thigh, the reflected pains of early hip disease, and the pains sometimes complained of in commencing popliteal aneurysm, may simulate mild chronic rheumatism; the differential diagnosis is easily made by physical examination. The non-affection of such articulations as the temporo-maxillary, the sterno-clavicular and the inter-vertebral is considered to distinguish severe chronic articular rheumatism from advanced rheumatoid arthritis; but such distinction must be regarded as little more than arbitrary. The pains of syphilitic periostitis are mostly experi-

enced in the shin, the parietal and the frontal bones, are greatly aggravated by pressure, almost invariably more severe during the night, and are apt to be associated with local bosses—syphilitic nodes.

Treatment.—Change of residence to a drier, more sunny and less variable climate—for the colder part of each year at all events—is a most valuable measure whenever it can be adopted. A temporary submission to the local regimen of Bath, Buxton, Droitwich; or of Aix-les-Bains, Baden and other similar continental health-resorts is also useful. The Turkish and the ordinary vapour bath give good results in suitable cases. Warm woollen underclothing, frequently changed; sufficient regular exercise, short of fatigue; early hours; warmth and efficient ventilation of living and sleeping rooms are all useful measures. The diet should be rich in fats and poor in sugar, the food being eaten slowly, and at regular intervals. The stronger wines and ale should be avoided. Freedom from all mental and physical excess and from worry, are important points in the general hygiene of rheumatic subjects. Medicinal treatment includes the administration of cod-liver oil; of a long-continued course of potassic iodide and arsenic, in fairly large doses, in infusion of broom; together with alkalies, bark, iron and strychnine, as indicated by the condition of the general health; and careful attention to the hygiene of the skin, teeth, bowels and kidneys. The ammoniated tincture of guaiacum, with bromide of ammonium and a hepatic stimulant, such as podophyllin or euonymin, is sometimes serviceable. Sulphur in lozenge or pill, or in the old-fashioned prescription of an abundance of freshly prepared mustard taken at each meal, is undoubtedly of value. And some cases, otherwise intractable, have markedly improved during the administration of a strong infusion of common horse-radish (a large stem scraped into a pint of sound whisky or gin or old ale; 1 or 2 ounces of the infusion, after standing for twenty-four hours, to be taken night and morning for a month), and of extract. conii, gr. iij in pill, night and morning, with a diuretic alkaline mixture. Chronic rheumatism occurring in the syphilitic and in the gouty is favourably influenced by the iodides and by colchicum respectively.

Local treatment is always called for, and often affords great relief. It includes counter-irritation by iodine or blisters; friction with stimulating and anodyne liniments, especially after hot bathing or

fomentation; the continued application of a hot saturated solution of common salt in vinegar, friction with flowers of sulphur; local steaming of the affected joints; passive motion; and massage.

C. E. SHELLY.

RHEUMATISM, GONORRHEAL (Gonorrhœal Synovitis; Urethral Rheumatism).—Persons suffering from a discharge from the genito-urinary mucous membranes are apt to develop an inflammatory affection of the joints, with their associated muscles and fibrous structures, which presents points of resemblance on the one hand to articular rheumatism and on the other to pyæmia.

The disease is usually observed in the course of a gonorrhœa, sometimes appearing during the early and acute stage of that malady, but often not until after it has subsided into a simple gleet, or even not until after all discharge has ceased. It is far more common in men than in women; its subjects often possess a marked tendency to gout or to rheumatism; it is apt to be excited by local injury or chill. A previous attack begets a decided predisposition to a recurrence of the disease on every re-excitation of urethral inflammation, whether this be simple or specific.

Symptoms.—The knee is the joint most commonly and chiefly affected, probably because it is that most liable to strain and injury: but the patient may first complain of pain in the lumbar and plantar regions with swelling of the feet, then the ankles, knees, or wrists become suddenly hot, tender, and extensively swollen. The pain and tenderness may extend to the fasciæ, especially of the loins, the palms, and the soles; to the tendons (as the tendo-Achillis); to the muscular aponeuroses, as of the thigh, arm, and shoulder; and to the nerve-sheaths, as of the sciatic. At the same time a well-marked catarrhal conjunctivitis is frequently developed in one or in both eyes.

The amount of pain, and both the degree and the extension of the joint symptoms, vary much in different cases, but there is always more or less malaise and anorexia, with furred tongue, restlessness, and depression. In the mildest cases the arthritic symptoms may be limited to only one or two joints and may speedily decline; or while the pain disappears, the affected joints may remain weak and distended by a chronic synovitis, but free from tenderness. In

the most severe instances the disease progressively invades one joint after another, those previously attacked recovering but slowly or even scarcely improving at all; so that in the course of several weeks or months all the joints may become affected, including the sterno-clavicular, the maxillary, and the inter-vertebral, as in the worst cases of chronic rheumatic arthritis. In the more chronic cases, the general symptoms grow gradually less acute, there is little, if any, fever, and the appetite is retained; but the patient becomes debilitated, depressed, and generally impaired in health in proportion to his persistent and increasing helplessness.

The disease is of very variable duration, but is not directly fatal.

Diagnosis.—This hinges mainly on the association of joint-inflammation with an existing, or recent, discharge from the urethra; it is strongly suggested by the occurrence of the articular symptoms in a young male, which should always prompt to a careful examination of the patient's urethra, and by the co-existence of conjunctivitis; it may also be assisted by a previous history of similar illness in connection with gonorrhœa, or by the history of a liability to urethral discharge or irritation, and by the absence of cardiac complications.

Pathology.—The affected joints are in the early stage acutely inflamed, hyperæmic, and distended with serous effusion; the surrounding structures are also swollen or cedematous. In a more advanced stage of the disease the intra-articular effusion becomes flaky or even purulent, the cartilages may become eroded, and the joints ankylosed or utterly disorganized. It is noteworthy that the heart and pericardial structures are never involved in the morbid process.

Ætiology.—The causation of gonorrheal rheumatism is obscure; very often it is not "gonorrheal" at all, being developed in connection with a merely simple, gouty, or traumatic urethritis. The disease has been variously regarded as acute or sub-acute articular rheumatism accidentally associated with a gonorrheal or similar urethritis; as a form of pyæmia originating in infection from the inflamed urethral surface; and as a reflex tropho-neurosis excited by an abnormal state of the genito-urinary system. It may be observed that the pyæmic and the tropho-neurotic theory might each equally well explain those cases of articular disease which have been observed in connection with chronic in-

flammatory discharges from other mucous surfaces—e.g., in chronic endometritis, in chronic bronchitis, and in dysentery; while a reflex tropho-neurotic irritation would also explain the recurrent swelling, pain, and tenderness of the joints, which are, in some women, regularly associated with pre-menstrual pyrexia, and would better account for the absence of all those cardiac complications which are so frequent in true rheumatism.

Treatment.—The proper treatment of an existing gonorrhœa, including an appropriate dietetic regimen, must be persevered with. A sharp purge, followed by full doses of alkaline salines, with quinine or the salicylates, should be given in the acute stage; in the later stage, and in more chronic cases, potassic iodide with alkalies, iron, and nux vomica or bark, are useful; and mercury may be given with good effect if syphilis be present. Rest—which must be absolute in severe cases—should be afforded to the inflamed joints, while pain is relieved by the application of hot fomentations with anodyne liniments of opium or belladonna, or by light blistering; and in sthenic cases by local leeching. Sub-acute cases are benefited by firm strapping of the affected joints; and in the chronic forms friction, massage, galvanism, and moderate exercise are useful. The more intractable cases, and especially those in which ankylosis is threatened, should betake themselves to a warm dry climate—and preferably to some health-resort at which they can be subjected to a complete course of thorough and persevering treatment.

In every instance, the patient should be impressed with the double fact that, while the danger of a recurrence of the joint-inflammation increases with each fresh exposure to infection, prognosis increases in gravity with each repetition of the attack.

C. E. SHELLY.

RHEUMATISM, MUSCULAR.

—This form of the disease affects single muscles or groups of muscles, with their associated tendinous expansions, in various parts of the body.

Symptoms.—It is marked by local pain, severe and often lancinating in character, aggravated by movement and by slight or irregular pressure, but relieved by firm support and by complete relaxation of the affected muscle. It is usually accompanied with more or less general febrile disturbance, which may closely resemble that noted in the milder cases of acute rheumatism, and sometimes

with a catarrhal (rheumatic) conjunctivitis, but pain is often the only symptom of any note. Even in mild cases of muscular rheumatism, the more acute symptoms may last for many days, or even weeks; they decline gradually in severity, are liable to sudden and severe exacerbations if the affected part be again exposed to any exciting cause, and are, for a long time after their apparent cure, prone to recur upon slight provocation. In its most chronic form the disease never entirely leaves the patient, who suffers from an increase of his habitual pain in the affected muscles or tendons with every recurrence of cold or damp or snow, and especially with the onset of east and north-east winds.

Local varieties of the malady have been distinguished by special titles. Thus, a rheumatic condition of the muscles of the neck, notably of the sterno-mastoid and trapezius, constitutes muscular *torticollis*, *wry-neck* or *stiff-neck*; of a part of the intercostal, pectoral or serratus muscles, *pleurodynia*—this is frequently excited by coughing, sneezing, &c., it is not accompanied by the auscultatory and other physical signs indicating disease of the lungs, pleura or heart, or by the three *points douloureux* which are pathognomonic of intercostal neuralgia. *Lumbago* affects the muscles of the loins and their fibrous attachments, on one or both sides; it compels a more or less stooping posture, and is much aggravated by any attempt to bend, twist or straighten the back. The symptoms are usually very characteristic, but care must always be taken to exclude other possible causes of lumbar pain, especially disease of the kidney, bladder, uterus and rectum, perinephritis and perityphlitis, abdominal aneurysm, caries of the spine and lumbar abscess, spinal meningitis, hip disease (rheumatic or other), sciatica, &c. *Lumbago* sometimes co-exists with a similar rheumatic affection of the abdominal muscles; and this, again, may be observed without any associated pain in the loins. *Dorsodynia*, *omodynia*, or *scapulodynia* signifies rheumatism of the muscles of the shoulders and upper back; and *cephalodynia* affects the occipito-frontalis muscle, the pain being chiefly experienced in the forehead or occiput and sometimes involving the eyeballs.

Muscular rheumatism, in any form, may appear suddenly, or the muscular pains may be preceded by a day or two of moderate febrile malaise, sometimes accompanied with sore throat.

Pathology.—No special pathological

changes—beyond those which necessarily result from impaired motion of the structures involved—have been recognized in this disease.

Etiology.—The disease is most frequent in persons of the rheumatic diathesis, and its development is favoured by causes identical with those which predispose to the acute disease; the directly exciting cause is frequently the exposure of a muscular surface to local cold or draught immediately after active exertion and during free perspiration; or, again, the sudden or awkward execution of some unusual or excessive muscular effort. It is not limited to any special period of life, but torticollis is common in childhood, pleurodynia in adolescence, and lumbago is more usually met with in the adult and aged.

Treatment, prophylactic and general, is essentially that of the rheumatic diathesis (see RHEUMATISM, ACUTE, and CHRONIC). An effective purge at the outset should be followed by alkalies and salines; the iodides, with arsenic and guaiacum, are serviceable when the symptoms are protracted or obstinately recurrent, and debilitated subjects require iron, quinine and a more generous dietary, often with a fair proportion of bland, sound stimulants.

Local treatment is important, and includes especially local rest and support, as by strapping, and counter-irritant applications, *e.g.*, turpentine stupes, mustard plasters, hot fomentations and stimulating liniments; and anodynes, such as belladonna liniment and plaster, morphine *sub cute*, &c. Immediate recourse to a vapour bath sometimes cuts short an attack; as also will a hypodermic injection of atropine (gr. $\frac{1}{100}$ to gr. $\frac{1}{50}$), this latter often proving effective in lumbago. Local warmth and protection from cold and damp are highly necessary. Cases otherwise intractable are benefited by a change of climate, and by the use of such thermal and mineral waters as are recommended in the articles RHEUMATISM, ACUTE, and CHRONIC. C. E. SHELLY.

RHINITIS, ACUTE (Acute Nasal Catarrh; Coryza).—Acute catarrhal inflammation of the mucous membrane of the nose, *i.e.*, an ordinary cold in the head.

Symptoms.—The chilliness, headache and feeling of stuffiness in the nose, followed by sneezing and discharge of a watery, irritating fluid from the nostrils, are such a common experience that it

will be unnecessary to do more than mention them. After a time the watery fluid becomes muco-purulent, and finally ceases. Accompanying the local manifestation there are usually evidences of constitutional disturbance, as shown by slight pyrexia, loss of appetite, furred tongue, constipation and high-coloured urine.

Pathology.—There is hyperæmia of the mucous membrane of the nose, with increased cell-proliferation.

Ætiology.—There seems to be an hereditary tendency to coryza, and there is also some evidence in favour of its contagiousness. Exposure to cold and damp, especially when the system is below par, is the chief exciting cause.

Treatment.—This, to be of any avail, must be undertaken at the very commencement of the attack. The most successful plan is the administration of 10 minims of tincture of opium, $\frac{1}{2}$ drachm of the spiritus ætheris nitrosi, $\frac{1}{2}$ ounce of the liquor ammonii acetatis made up to an ounce with camphor water, every six hours for four doses, the patient meanwhile being kept in a well-warmed room, and on a light diet. When the acute symptoms are over, quinine may be given with advantage. The writer can speak from personal experience of the utility of carbolized smelling salts in warding off a threatened attack of coryza. The following formula can be recommended:—R Acid. carbolicæ ꝑviii. ammon. carb. ʒij, pulv. carbonis ligni ʒij, ol. lavandulæ ꝑvj, tinct. benzoini co. ʒj, liq. ammon. fort. q.s.; misce bene

F. DE HAVILLAND HALL.

RHINITIS, CHRONIC ATROPHIC (Ozæna).—Chronic inflammation and subsequent atrophy of the mucous membrane of the nose, accompanied by the formation of dry crusts and by a most offensive odour. The term *ozæna* was applied to the disease on account of this odour.

Symptoms.—Patients generally complain of some feeling of discomfort or irritation in the nose, and this may lead them to pick or scratch the interior, producing excoriation of the mucous membrane and slight hæmorrhage. The prominent symptom, however, is the odour which proceeds from the nose; this is something quite indescribable and *sui generis*, but once experienced it is readily recognized. The patient, fortunately for himself, loses the sense of smell. There is a puriform secretion which rapidly dries up, forming hard,

greenish-brown crusts, sometimes the size of the last phalanx of the patient's little finger. Owing to the dilated and altered condition of the nasal passages air reaches the larynx and lungs without being filtered, warmed and moistened, so that a dry and atrophic condition of the pharynx, and chronic laryngeal and bronchial catarrh frequently complicate the rhinitis. It also gives rise to many reflex symptoms, such as paræsthesiæ in the throat and larynx, headache, neuralgia, giddiness, &c. Ear trouble is met with in some cases; e.g., acute and chronic catarrh of the middle ear.

On making a rhinoscopic examination, it will be found that the nasal passages are so capacious that the posterior wall of the pharynx can often be distinctly seen; the mucous membrane is usually covered with greyish crusts of inspissated mucus, which stink abominably, and on the removal of these it is found excoriated or abraded in places, and may bleed a little, but the occurrence of well-marked ulceration is unusual; the middle turbinated body is more often excoriated than other parts of the nose. The colour of the mucous membrane may be normal or pale; sometimes it is slightly reddened.

By posterior rhinoscopy a similar condition of atrophy can be recognized in the posterior nares. Almost invariably the pharynx will be found dry and glistening or covered with adherent mucus, which in towns is usually black from soot and other impurities in the air, the capacious nostrils having failed to arrest them. A dry glazed state of the pharynx or the presence of adherent mucus should suggest the idea of atrophic rhinitis.

Diagnosis.—This is seldom a matter of any difficulty; the characteristic stench emitted by the patient and the dilated nasal passages with dry crusts of mucus are not present in other diseases. Suppuration in the antrum might possibly be mistaken for atrophic rhinitis, but in this condition the discharge is one-sided, and, as Christopher Heath points out, "the offensive smell is perceived only by the patient, and not by his friends, the reverse being the case in *ozæna*; and, again, the discharge is only occasional, is determined by the position of the head, and is simply purulent, whereas in *ozæna* the discharge is constant, and mixed with offensive crusts from the nasal cavities."

Prognosis.—Atrophic rhinitis does not in any way threaten life; it is, however, a most obstinate disease to treat, and

some of the best authorities aver that, though relief may be obtained, a cure is unknown.

Morbid Anatomy.—Much discussion has taken place in regard to two points connected with the pathology of atrophic rhinitis: first, as to whether it is always preceded by an hypertrophic stage? Second, whether a specific micro-organism is at the root of the mischief? The first question must be answered in the affirmative, as there is no evidence of a primary atrophic rhinitis; everything points to the atrophic being a sequel of pre-existing catarrhal inflammation. The atrophy affects all the structures of the nose, the bones shrinking as well as the mucous membrane. Some writers attribute the characteristic smell to change taking place in the gland cells, with fatty degeneration and liberation of the fatty acids. Whether this be so or not, there is no doubt that the increased size of the nasal cavities plays an important rôle in the production of the disease, as it allows the dried secretion to be retained, and this still further irritates the mucous membrane. On the other hand, there are authorities who maintain that atrophic rhinitis is predisposed to by defective development of the turbinated bodies and osseous structure of the nose generally. As regards the existence of a specific micro-organism, this must remain an open question; but the absence of bacteria in the mucous membrane renders it unlikely that the disease is of parasitic origin. The bacteria found in the secretions are probably concerned in the production of the factor, but are not the cause of the disease.

Ætiology.—It is possible that certain diatheses, especially inherited syphilis, may exercise considerable influence upon the formation of the atrophic stage of rhinitis, but under what conditions is unknown. The only factor as to the existence of which the writer has been able to satisfy himself is anæmia, the disease being most frequently met with in anæmic young women. Bearing in mind the frequency of gastric ulcer in the same kind of patients, it would seem that there is a special vulnerability of the mucous membrane in anæmia. The great majority of the cases commence in early life, and only very seldom are they seen to begin after twenty-five. The disease is much more frequently met with in women than in men—in about the proportion of seven to two.

Treatment.—If any underlying general condition of ill-health can be discovered,

this should be treated. In anæmia the combination of 3 minims of arsenical solution with 10 grains of ammonio-citrate of iron given thrice daily generally exercises a beneficial effect. The writer has not seen any good resulting from the administration of iodide of potassium in ozæna due to atrophic rhinitis. It is, however, on local treatment that the chief reliance is to be placed. Thorough and systematic cleansing of the affected parts must be insisted on. This can most satisfactorily be done by the use of the hand-ball spray apparatus. Ten grains of a mixture of equal parts of common salt, borax and bicarbonate of sodium and 5 grains of white sugar in 2 ounces of warm water will be found very useful. In some cases the addition of 10 or 15 minims of the glycerin of carbolic acid to the above solution will be found advantageous; or the sugar may be omitted, and 10 to 15 minims of the solution of the permanganate of potassium substituted. At first it may be necessary to spray out the nostrils two or three times daily, but as improvement takes place it will be possible to lessen the frequency. After the nostrils have been thoroughly cleansed, various astringent and antiseptic remedies may be tried. The writer has had good results from the insufflation of equal parts of iodol and boric acid. Weak solutions (5 to 10 grains to the ounce) of sulphate of zinc or alum may be tried. A spray of thymol gr. $\frac{1}{2}$, glycerin and alcohol āā 3ss, in water ℥j , used two or three times a week, and followed by fluid cosmoline in an atomizer, has been highly praised. In some obstinate cases using a tampon of cotton-wool, either medicated or plain, as recommended by Gottstein, has given relief when other measures have failed. Anointing the interior of the nose at night with vaseline after previous spraying is sometimes successful in preventing the formation of crusts, or an oily solution of menthol (20 per cent.) may be poured into the nostril and allowed to run into the throat. F. DE HAVILLAND HALL.

RHINITIS, CHRONIC HYPERTROPHIC (Chronic Nasal Catarrh).—A chronic inflammatory condition of the mucous membrane of the nose.

Symptoms.—The chief complaint made is of the excessive flow from the nostrils, which may be watery or muco-purulent in nature. There is generally also a feeling of stuffiness in the nose, a nasal twang to the voice, and deafness, due to

catarrhal swelling of the Eustachian tubes. On a rhinoscopic examination, the mucous membrane of the nose is found to be thickened, and this is usually most marked over the inferior turbinated bodies. The application of cocaine will cause constriction of the mucous membrane, but not to the same extent as when there is simply swelling of the erectile tissue without any hyperplasia.

Pathology.—There is an increase in the thickness of the mucous membrane of the nose, due to the increased afflux of blood and consequent increased cell-proliferation and tissue formation.

Ætiology.—The condition is the sequel of repeated attacks of acute coryza.

Treatment.—The general health of the individual must be improved by attention to the points indicated in the article on CHRONIC PHARYNGEAL CATARRH (*q.v.*). Locally, relief may be effected by the use of the chloride of ammonium inhaler, or of the alkaline spray, and after thorough cleansing of the mucous membrane mild astringents, such as acid. tannic. gr. v-x ad 3j, zinc. sulph. gr. v-x ad 3j, or potass. chlor. gr. x, may be ordered in the form of spray; but in the majority of cases the galvano-cautery, as advised under HAY FEVER, must be employed to cause contraction of the thickened membrane, before much improvement can be expected. The writer has found speedy and marked improvement follow free cauterization of the turbinated bodies; in some cases even a single application will suffice to give great relief.

F. DE HAVILLAND HALL.

RHINOSCLEROMA.—An extremely rare form of granulation tumour which arises from the anterior nares or adjacent parts.

Only very few cases have been observed in England, and all in foreigners. The majority of reported cases have occurred in Austria and Italy, but the disease is said not to be very rare in Brazil.

Symptoms.—It first shews itself in the form of raised tubercles of bony hardness, isolated or conglomerate, arising from the septum or alæ of the nose, the upper lip, or palate. The colour of the skin may be unaltered or deep brown. Soon the surface cracks, viscid fluid oozes forth and dries up to form scabs. The nose becomes flattened out, finally the nostrils are occluded. Pain is complained of only when the growth is pressed upon. No secondary growths occur, but rapid return of the disease has always followed its extirpation.

Pathology.—The growth consists of a dense small-celled infiltration with very little stroma. As in the closely related granulomata—lupus and lepra—characteristic bacilli have been conclusively demonstrated.

Diagnosis.—Differential diagnosis must be established from syphilis, keloid and epithelioma.

Treatment.—Injections of a 2 per cent. solution of salicylic acid of soda, combined with douches, snuffs, and ointments of salicylic acid, are said to have brought about some improvement.

J. J. PRINGLE.

RHINOSCOPY.—The examination of the nose. That of the anterior nares is termed anterior rhinoscopy; that of the posterior nares, posterior rhinoscopy; for both kinds the reflector and light used for making a laryngoscopic examination are employed.

In order to appreciate what is seen, the observer must habituate himself to the examination of noses both in health and disease, for it is only by comparison that it is possible to distinguish the normal from the abnormal, as the arrangement of the turbinated bodies, the direction of the meatuses, and the position of the septum, vary very much.

For Anterior Rhinoscopy the specula usually employed are Thudichum's, Fraenkel's fenestrated instrument, and Duplay's bivalve speculum. The spring of Thudichum's speculum is so stiff that patients complain of the pain caused by its introduction; the mucous membrane prolapses through the fenestræ of Fraenkel's, and thereby obscures the view. Duplay's speculum is most suitable for general use, the others being only necessary in exceptional cases.

By anterior rhinoscopy the inferior turbinated, and most of the middle turbinated, can be seen, and occasionally a glimpse is obtained of the upper turbinated bodies. The condition of the passages between them and the state of the septum can also be inspected.

Posterior Rhinoscopy.—Posterior rhinoscopy is a much more difficult task than making a laryngoscopic examination, as there are a certain number of persons in whom on account of the conformation of the naso-pharynx it is impossible to obtain a satisfactory view of the posterior nares, or in some cases any view at all. The best mirror for posterior rhinoscopy is Fraenkel's; the mirror is attached to the shank by a hinge, and is so arranged that by pressing

a trigger the mirror may be placed at any angle with the shank. Before commencing the examination the patient is told to hold the breath, or else to breathe quietly through the nose, and to say "hang" if requested. The object of this advice is to arrange that the soft palate may hang down in a relaxed condition, and not be drawn up tightly against the pharynx. The tongue is then gently depressed by a suitable spatula held in the left hand, and the rhinoscopic mirror, well warmed, is introduced behind the soft palate, on one side or the other of the uvula. When it is in position the trigger is pressed so as to elevate the mirror, and by this means a view of the posterior nares may be obtained. Should the soft palate be very irritable, both it and the pharynx and tongue may be sprayed with a 20 per cent. solution of cocaine, or the solution may be applied by means of a brush. This will facilitate the view of the posterior nares, both by causing contraction of the mucous membrane, and thereby increasing the size of the passage, and also by abolishing the sensibility of the palate, and thus permitting the speculum to be opened wider than could otherwise have been the case.

Various hooks and snares have been recommended for pulling the soft palate forward, but men of great experience in this method of examination, such as Schech, do not employ them, and say that more is to be done by patience than by instrumental assistance. Beyond stating the bare facts that on a rhinoscopic examination (or rather, on repeated examinations, because on account of the smallness of the mirror and the anatomical arrangement of the parts, they cannot all be brought into view at the same time) the septum nasi, the posterior extremities of the superior, middle and inferior turbinated bodies, with the superior, middle and inferior meatuses, and the orifice of the Eustachian tube should be seen, it is useless, without the aid of a diagram, to describe the appearances met with in such an examination.

F. DE HAVILLAND HALL.

RICKETS.—A disease of the whole of the tissues of the body, having its most characteristic manifestations in the bones.

Symptoms and Course.—The earliest symptoms are referable to the nervous system: restlessness—chiefly nocturnal, the bed-clothes being kicked off, and

sweating, also chiefly nocturnal, and occurring most abundantly about the head. Tenderness is another symptom; but this is often absent, and has probably been confounded with the "touchiness" or irritable weakness of the nervous system. Beading of the ribs and enlargement of the wrists are the earliest bony signs of rickets. The bony changes may be of the slightest kind, or of the most marked degree. The cranium presents different changes in different cases. It may be brachycephalic or dolichocephalic or asymmetrical; there may be "bossing" of the parietals and frontals and craniotabes (*q.v.*) may be found. A square, broad forehead, and overhanging brow, is regarded as of rachitic origin, but such protuberance below the frontal eminences, and sometimes of those parts, may certainly be due to syphilis, and may accompany brain defects without syphilis or evident rickets. The anterior fontanelle is often larger than natural, and may not be closed till long after the usual period—eighteen months of age. The face and jaws are small by comparison. The teeth are often cut late; there may be but one tooth in the jaws at the age of eighteen months. The growth of the skeleton generally is usually much retarded, and the long bones become curved, but not always in the same direction. The forearms become convex backwards, the humerus convex outwards about the deltoid insertion; the femur convex outwards and forwards; the tibia convex forwards, or else bent at a right angle (sabre-shaped tibia) at the junction of the middle and lower thirds. The ligaments become weakened and elongated, so that deformities of the joints may appear. The thorax may show lateral grooves passing downwards and outwards, usually external to the beadings, at the junction of the cartilages with the ribs; the sternum is convex forwards— anterior convexity. The outline of a transverse section is fiddle-shaped, and so also is the shape of the trunk, as made up of the thorax and abdomen; the latter being large and globular, corresponds to the wide part of the belly of the violin. Rickety children are very prone to catarrh of the respiratory and alimentary tracts; also to convulsions, tetany and laryngismus (*q.v.*)

Diagnosis.—This is easy if the beading of the ribs be perceptible to the touch; but in slight cases the failure of the child's health may not be attended by any recognizable bone change. It is very common in feeble infants a few weeks

or months old to note the sign of craniotabes. When the wrists are enlarged and the bones curved, the merest tyro may diagnose rickets with ease. Excessive irritability of the muscles and nerves and chronic catarrh are seldom due to anything else than rickets during the first months of life. The knee jerks are always exaggerated; ankle clonus may very rarely be obtained.

Prognosis.—As a rule this is good; but a few cases may persist or pass on to the stage of late rickets, but not, the writer thinks, if suitable treatment be carefully carried out. The dangers to life come rather from the nervous and pulmonary complications or accompaniments of rickets. The prognosis, therefore, varies with the prominence of such symptoms, and with the general state of health. Bronchitis and diarrhoea do not usually fail to yield to judicious treatment.

Pathology.—Rickets affects all the tissues, but especially those which are growing most rapidly—the nervous system and the bones. Infants are prone to catarrh of the mucous membranes and have very excitable nervous organs. Rickets promotes both these tendencies by debilitating and irritating these tissues. The bone changes and osteal neoplasia, though often most evident, are far less important as regards the life of the child than the catarrhal complications, the muscular debility, and the neurosal liabilities. A rickety infant is liable to universal convulsions; to tetany, especially of the extremities; and to tonic spasm of the larynx (eclampsia, tetany, laryngismus stridulus). It is prone to naso-bronchial, gastric, and enteric catarrh, rickety bronchitis, and diarrhoea. Rickets is credited with the power of causing splenic, hepatic and lymphatic enlargement; but some hold that in these cases congenital syphilis is co-operative and chiefly causative. Bossing of the frontal bones more than the parietal bones is probably of rachitic origin. The author has seen many cases which support this view, which may be restated thus:—if the parietals are more thickened than the frontals, the chief cause of the bone change is syphilis. Craniotabes, localized atrophy of bone, producing the so-called “parchment crackling,” is believed to be due to rickets as well as syphilis. It is doubtful whether rickets causes true tenderness of the muscles; there is in bad cases a general hyperæsthesia and “touchiness”—a rachitic neurasthenia; and there are

some grounds for believing that rickets may induce peripheral neuritis. But true tenderness should suggest the co-existence of scurvy, with hæmorrhages in the periosteum of bones, or of syphilis with inflammatory new growths about the periosteum and the area where the shaft and epiphysis join.

The beaded ribs (rickety rosary) are common effects of rickets, the thickening being most evident at the junction of the ribs with their cartilages; the fifth, sixth, and seventh are most affected, and the visceral aspect much more than the subcutaneous. Situate about the angles of the ribs behind, there may be found, especially at necropsies, posterior beadings or nodosities, which perhaps commence as spontaneous fractures; or the great strain on these parts may excite a new formation of bone.

An infiltration of the frontal lobes of the brain with an albuminoid-looking material, as described by Sir William Jenner, is, in the opinion of the writer, due to simple œdema and anæmia. The edges of the frontal and other flat bones of the skull are said to be thickened at the cranial sutures, the sutures appearing as furrows, but close observation shows that the furrows are not precisely at the sutures and are really grooves in the bone, in which dilated veins run.

The relationship of rickets to osteomalacia is obscure. In some cases of rickets there is bone softening, resulting from a sort of rarefying osteitis, and there may be a growth of new limeless bone having but little consistence. Billroth has called osteomalacia a fungous, fatty osteomyelitis, the hard mineral bone disappearing before the advance of fungoid granulations, some of which have become fattily infiltrated. But Rindfleisch asserts that in osteomalacia the salts of the compact bone are first dissolved out, whilst the organic matrix remains longer, and the dentate or crenate outline of the bone around the fungating material is not found in that disease, there being a gradual thinning of the bone with retention of its smooth surface (halisterischer bone atrophy of Volkmann).

Microscopical Appearances.—The most characteristic histological change in rickets consists in the irregular overgrowth of the layer of proliferating cartilage at the area of junction of the shaft and epiphysis. This lamina is like a disc in healthy ossification, whereas in rickets it is very uneven, and sends roots or peninsulæ into the vascular shaft;

sometimes islets of proliferating cartilage wholly detached from the parent growth are seen there. Around the bone at the junction of the shaft and epiphysis, and beneath the periosteum, a spongy soft vascular overgrowth takes place (spongoid tissue). Instead of there being a regular neat conversion of cartilage into bone, there is irregular overproduction of cartilage and of a soft granulation tissue which fails to grow into Haversian systems of lamellar bone. In microscopic section of the excessively overgrown red medulla a network composed of irregular fibrillated tissue, containing angular corpuscles, may be seen; the perverted representatives of what would have been true bone corpuscles. In the meshes of the network there appears a small round-celled highly vascular growth; this is like the new formation beneath or in the periosteum.

The changes at the epiphysial lines curtail the growth of the bone in length, but the wealth of medullary tissue entails an excessive production of compact tissue, hence the stunted dense bones of completed rickets. During the active period of rickets it is obvious that there must be a great defect of mineral matters; in Kassowitz's view, the new formation of blood-vessels and the hyperæmia are the real causes which melt away the bone and prevent deposition of lime.

The blood changes in rickets are like those found in anæmia; it is possible that this impoverishment and poor formation of the blood is the agency which determines the rachitic changes in the nervous system, bones, and other tissues. Altered blood may also conceivably cause fibroid growth in the spleen, liver, and lymphatic glands, such as may be found in some cases in which true rachitic changes occur.

Ætiology.—The combination of bad air, bad feeding, bad light, and want of cleanliness and sleep, is the one most likely to produce rickets. Excessive feeding with starchy compounds is a more effective factor during the early months of life than the giving of fats and proteids; but any method of feeding which throws upon the digestive and assimilative organs work of an unnatural kind tends to produce rickets.

It may certainly date from foetal life, but the so-called foetal rickets is frequently not identical in essential changes with ordinary rickets.

It chiefly affects infants during the

first two years of life, and is in some form or other the commonest infantile disease of populous towns.

Treatment.—This requires minute attention to details, but two broad principles have to be kept in view: rectification of the hygiene, especially of the dietary, and the use of tonic measures. Not only may the food given be of the wrong description, but it is often also indigestible; hence the necessity for careful consideration of the diet. The fact that the gastric juice does its work best when the surface on which it has to act is most extensive is the reason for ensuring a fine division of the curd of milk and of any other food. Minced meat, pounded chicken and fish, cream and milk, may be safely recommended. A little wine just before or with the chief meal may prove of great service. As a rule, sugary and starchy foods are given in excess. Food should be taken at regular intervals.

The castor-oil mixture is very serviceable in cases of slimy diarrhoea of rachitic origin: \mathcal{R} Olei ricini $\mathfrak{m}\mathfrak{v}$, mucilag. tragacanth $\mathfrak{m}\mathfrak{xv}$, syrapi $\mathfrak{z}\mathfrak{ss}$, aq. menth. pip. $\mathfrak{z}\mathfrak{j}$; to be taken three times a day.

The diarrhoea, and its congener bronchitis, require protection of the chest and abdomen by means of woollen garments, which should envelop the whole of the body except the head and hands.

Correction of excessive acidity of the food and of the contents of the stomach and intestines is important. If fats agree, cod-liver oil, bacon fat, and cream may be given. Most children take well a mixture of cod-liver oil and vinum ferri. Other tonics may be tried, such as hypophosphites, lactophosphate, acid phosphate, or pyrophosphate. Phosphorus in doses of $\frac{1}{100}$ grain dissolved in sweet almond oil, a minim of the phosphate of oil, three times a day; phosphate of lime in 2-grain doses; syrup of the phosphate of iron, or of the hypophosphites or of the iodide of iron, are valuable preparations. Letting the child sleep in a hammock is a suggested mode of preventing chills due to perspirations, which for some reason are most copious during sleep and about the forehead. Frequent exposure to the fresh air is a most valuable tonic. "Send the child out six times a day for ten minutes at the time" is a good prescription, and this may be done in almost any weather if due precautions are adopted against cold.

Late Rickets would appear to be fairly

well named, since in these cases occurring in children after the period of infancy (after two years) there is over-production of cartilage at the epiphysal line. But the disease may possibly be only a recrudescence of infantile rickets. It may follow acute illnesses, especially measles and scarlatina. Whether it be really identical with rickets is a speculative pathological problem; and, with regard to congenital and foetal rickets, the same may be said.

Foetal Rickets is often foetal cretinism. Its main features are:—Large head, large belly, thick stunted limbs, depressed nose root, and abundant overgrowth of subcutaneous tissue. The thyroid gland may be normal or enlarged, but the "cartilaginous digitation" of rickets is absent; in its place a fibrous lamina intervenes between the shaft and epiphysis. A premature ankylosis of the basi-sphenoid and basi-occipital bones is found as in cretins; the membrane bones are well grown or overgrown. The brain may be deformed owing to the shortening of the basis cranii and the over-development of the cranial vault, and sometimes dropsy of the ventricles is present. The heart may be malformed, but such cases usually succumb at birth.

Infantile Osteomalacia may be associated with rickets or occur separately. Cases have been described in which the whole skeleton, but especially the long bones, was softened, friable and thinned; fractures occurred easily, and craniotabes was present. Occasionally rachitic digitation of the growing cartilage was noted, and other alleged rachitic signs—*e.g.*, sweating without fever, splenic enlargement, anæmia, emaciation, restlessness, and sleeplessness. The bones exhibited in some cases buttresses of massive spongy osteoid tissue beneath the periosteum, as may occur in rickets, especially where greenstick fractures exist. The children were under two years of age; the cases frequently ended favourably after lasting a few months. The treatment of such cases is that of rickets. Congenital debility may be assumed to exist.

ANGEL MONEY.

RIGIDITY.—The term is applied to parts, which should be freely movable or distensible, but have become stiff and fixed.

It is used to designate the immovability of joints, the result of ankylosis, also the condition of the cervix uteri,

when it does not dilate coincidentally with the increase of uterine contractions. The arteries are said to be rigid, when they are no longer fully dilatable, on account of fibrotic changes in their coats, and the valves of the heart, when as the result of atheroma and other conditions they cease to be freely movable.

Muscular spasm is a frequent cause of rigidity, which often occurs in the course of paralysis, either of cerebral or spinal origin. It is not necessarily, however, due to an organic lesion, nor is it always associated with paralysis. Rigidity frequently supervenes in the course of *hysterical or functional paralysis*. It is then usually hemiplegic or paraplegic in its distribution, but in some cases all four limbs are affected and in others only one. Various positions are assumed by the parts attacked, but commonly the elbow is semiflexed, the thighs are adducted, the knees extended, the heels drawn up and the feet turned inwards in the position of talipes equino-varus. This condition is maintained during sleep, and remains constant during the day. It generally ends in more or less sudden recovery, but it may persist for years. In the latter case the muscles undergo a certain amount of wasting. It is believed that secondary sclerotic changes may occur in the cord, and so render the condition permanent.

The rigidity, which ensues *after hemiplegia*, is called "early" or "late," according as it occurs a few days after the attack, or in the course of a few weeks. The early variety is much the slighter, and consists usually of a flexion of the fingers and elbow on the paralysed side, intermitting throughout the day, and usually disappearing during sleep. It is supposed to be due to irritation of the fibres in the neighbourhood of the effused blood. Late rigidity in the upper extremity generally consists of a state of flexion of the various joints. The elbow is bent at a right angle, the wrist pronated and flexed, and the fingers curved in towards the palm of the hand. This condition is sometimes associated, especially in cases of incomplete paralysis dating from early life, with an irregular spasm, which has been termed *hemiplegia chorea* when it affects the whole limb, and *athetosis* when the thumb and fingers particularly suffer. Sometimes, though rarely, the elbow is straightened, the wrist extended, and the hand and fingers assume the position of the griffin's claw. The leg is much less frequently affected with rigidity than the

arm, but sometimes there occurs a certain amount of flexion of the hip, knee, and ankle. Mobile spasm is also much more uncommon in the leg. The muscular excitability is nearly always increased on the affected side, the various jerks (knee, wrist, and triceps) are exaggerated, and ankle clonus is obtainable. Not only may these expressions of increased irritability be transmitted to the healthy side, but rigidity itself has been described as is occurring in the opposite leg.

It is commonly supposed that late rigidity is due to a secondary sclerosis of the lateral columns of the cord, its extent being determined by the degree of the irritative process.

Meningitis and various diseases of the spinal cord, *e.g.*, disseminated sclerosis, myelitis, &c., may cause rigidity of the lower extremities by inducing spasm. As a rule the thighs are strongly adducted, the knees extended, and the heels drawn up. The same condition often results from acute angular curvature of the spine, and in such cases recovery not infrequently occurs. Rigidity may also ensue in the late stages of atrophic spinal paralysis and peripheral neuritis. It is then due, not to spasm, but to changes in the muscles and the subsequent formation of adhesions in the joints and in the sheaths of tendons.

WILLIAM GAY.

RIGOR.—A fit of shivering indicated by tremulousness of the limbs and chattering of the teeth. The patient feels and looks very cold, his lips, cheeks, nose, and finger tips are livid, otherwise he is pale. In severe cases the fingers appear to be shrivelled. The pulse is small and frequent, the respirations hurried and shallow. The surface of the body is cold, but the internal temperature is raised. The sensation of cold, resulting in shivering, is due to the contraction of the peripheral arteries, which prevents the access of blood sufficient to warm the superficial tissues.

Rigors are common in all forms of malarial fever, and acute diseases, especially pneumonia and erysipelas, are apt to be ushered in by rigor. In children and persons of a neurotic tendency a convulsion may replace the initiatory rigor of acute disease. A rigor occurring in the course of an illness not due to malaria should always suggest the possibility of pus formation, or it may indicate the occurrence of thrombosis. During

the rigor, warmth should be promoted by hot drinks, hot water bottles to the feet, and by wrapping the patient in warm blankets; afterwards, treatment will be directed against the disease which was the cause of the rigor.

RINGWORM (*Tinea Trichophytina*).—A contagious disease of the skin due to the presence of a vegetable parasite.

Ringworm of the Scalp (*Tinea Tonsurans*; *Herpes Tonsurans*).—One of the commonest and most troublesome diseases among children of all classes in this country.

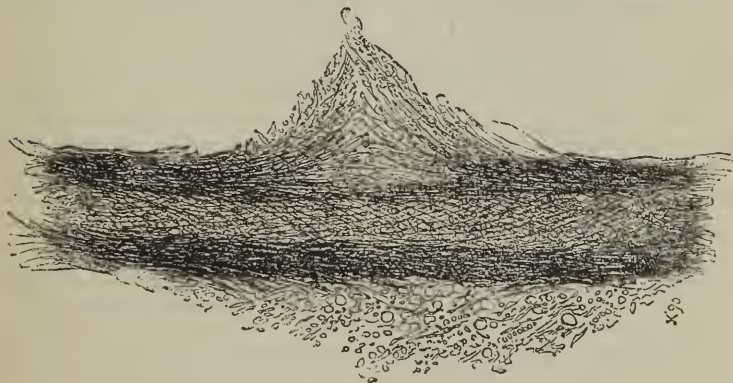
Eruption.—The disease first shows itself on the scalp, as single or multiple, circular or oval, irregularly distributed, reddish or greyish, scurfy spots, which may occasionally itch a little. In exceptional cases a little vesication may be present at the spreading edge, hence the misleading term, herpes tonsurans. The most striking feature of the spots is that the hairs over them are scanty, lustreless, stumpy, swollen at the root, with fringed or twisted ends, and often darker in colour than the normal hairs. The hairs surrounding the patch are also opaque and brittle. In very young children, or in those whose hair is fine, fair and scant, the ringed conformation of the patches is often marked, and the affected hairs, instead of sticking up from the surface of the skin, lie matted together. Generally, however, as the spots enlarge they lose their circular form, and by their coalescence form irregular patches which may finally involve the whole scalp. The rate of extension varies greatly in different cases. In a certain proportion, severe inflammation of the follicles and deeper structures ensues, producing tender, boggy, livid or red swellings, covered either with thick crusts and scabs or with numerous points of sticky, purulent fluid which correspond to the distended openings of suppurating hair follicles, from which pus can be easily expressed (*Kerion*). This condition is not exclusively confined to cases of tinea tonsurans, but is infinitely rarer as an epiphenomenon of other inflammatory diseases of the scalp; it seems to depend rather upon some constitutional peculiarity of the individual than upon special virulence of the micro-organism. As its consequence the fungus is destroyed, spontaneous cure occurs, but bald patches are very apt to result, from total destruction of the hair follicles.

In another class of cases—by no means rare—the hairs on the affected patches fall out with their root-sheaths attached, desquamation ceases, and absolutely bald, smooth, shining white patches, like those of alopecia areata, are produced (*bald ringworm*). Characteristic stumpy hairs can, however, almost always be found either at the margin of the patches or elsewhere upon the scalp; if one patch become thus affected others invariably follow suit.

The most obstinate cases are those of old standing in which the whole scalp is involved, much scaliness and baldness being thereby produced. The condition closely resembles dry seborrhœa or eczema of the scalp. Impetiginous inflammation may also arise either spontaneously or as the result of misdirected or too vigorous treatment; in either case it may play

or nearly cured cases, a useful adjunct or preliminary to microscopic examination is found in the application of pure chloroform, a drop of which, after evaporation, causes diseased hairs to become whitish, while healthy hairs retain their normal colour.

Pathology.—The fungus is best seen by examining detached hairs under the microscope (200–300 diameters) in weak liquor potassæ, after the removal of fatty matters by soaking in ether; the preparation is much more satisfactory if the hairs are immersed in liquor potassæ for at least a quarter of an hour before mounting. Some practice is also necessary for the detection of proper hairs for examination, only those which are broken and easily detached, carrying with them the root-sheath, being suitable. The brush-like distal extremity of the



Hair invaded by Fungus of Tricophyton.

havoc with the scalp, causing the disease to spread both in extent and severity, destroying the hair follicles and producing permanent—albeit usually partial—baldness.

Diagnosis is in many cases easy, but in others careful and repeated microscopic examination is necessary for the detection of the cryptogam. If the head be covered with crusts, scales or scabs, these must first be removed by poulticing or the continuous application of oil, after which the microscope will serve to differentiate the disease from impetigo, eczema, or the early stage of favus, with which it is readily confounded. Old-standing scurfy patches and cases supposed to be cured must be diagnosed from dry seborrhœa and psoriasis, and bald ringworm patches from alopecia areata. In dubious

hairs is characteristic. The hair-shaft is seen to be split up longitudinally by innumerable minute round polymorphous spores ($\frac{1}{1000}$ to $\frac{1}{5000}$ inch in diameter) and by long, wavy, transparent tubes or threads of branching mycelium. The spores and mycelium do not, as a rule, extend outside the inner root-sheath, a fact which explains the rapid cure of patches from which the hair falls spontaneously or which have been effectually epilated; but in very severe cases with perifollicular inflammation they have been described and figured outside the follicle and even throughout the papillæ and corium. The fungus probably finds entrance into the hair-shaft in two ways; after entering the orifice of the follicle and passing downwards along the hair-shaft (*a*) it may pass directly into it and

from this point of entrance spread up and down the shaft, or (b) it may penetrate as deeply as the soft hair-bulb and pass upwards with the growth of the hair. In ringworm of the scalp the mycelium is less abundant and less conspicuous than the spores.

Etiology.—The special frequency of the disease in England is generally ascribed to the favourable conditions for fungus growth afforded by a moist atmosphere and a mild winter. From its extreme contagiousness the disease frequently occurs in epidemic fashion in schools, villages, &c. Actual contact with an affected person, or with articles of toilet used by such, is probably necessary for its communication. As the result of infection from animals (cattle, horses, dogs, cats) it is much rarer than ringworm of the body, but when it does occur it assumes a specially virulent form. It is somewhat rare after puberty, and in the first year of life is only observed in much-neglected children, as repeated washing or any slightly irritant application (e.g., ink) easily cures it when the hair is fine and scanty. Ill-nourished, delicate, and especially strumous children are popularly—but probably incorrectly—supposed to suffer more frequently and more severely than the robust. Second attacks after complete recovery are very rare.

Treatment.—(1) *Preventive.*—This is important in large families and, if carefully carried out, is usually successful. In schools, however, it can seldom succeed; hence the necessity for the removal of affected children. The patient should be, as far as possible, isolated, should be furnished with separate brushes, towels, soap, &c., and should wear a light cap, loosely applied to the whole head, and lined with tissue-paper; the lining should be changed daily. Unaffected members of the family should have the hair cut short, washed night and morning with warm water and soft soap, carefully dried and scrutinized.

(2) *Curative.*—When a case is seen early, the hair is scanty and the distribution of the disease is ringed, any of the parasiticide remedies to be afterwards mentioned prove readily efficacious. In young children strong remedies ought never to be resorted to, as severe dermatitis is liable to be set up. Tincture of iodine, sulphur, and white precipitate ointments are specially valuable and simple applications for such subjects. "Bald" ringworm and kerion undergo almost spontaneous cure, but permanent,

patchy baldness is apt to result, especially in the latter case; for such, soothing applications—e.g., ointments of calamine or lead—are indicated.

The great majority of cases, however, come under observation when the disease is diffuse and of old standing, and their obstinacy depends upon the difficulty of directly attacking the parasite which lies, not on the surface of the skin, but deeply, at or near the bottom of the hair follicles. Mere irritation—e.g., by blisters—with a view to stifling the micro-organism in inflammatory products is distinctly less successful than the employment of direct parasiticides, which also have generally some irritant action that is in itself of service. Careful attention and considerable personal experience are always necessary to control the effects of treatment and to arrest inflammation at a point beyond which it is attended with dangerous consequences.

In every case the ground must be first cleared for action by the removal of crusts, scabs, scales or scurf, by poultices or rags soaked in oil, and by cutting the hair close with scissors. In severe diffuse cases shaving is imperative both for purposes of treatment and observation. Opinions differ as to the propriety of frequent washings, probably the rule laid down by Dr. Liveing is a good one, that the head ought to be washed with soap and warm water once a week if ointments are being applied, but daily if lotions are being used; in either case the scalp ought to be thoroughly dried after washing.

The multiplicity of methods and drugs recommended as infallibly curative is the best possible proof of the unsatisfactory character of our present remedies against the disease. Only those which the writer has tried and considers satisfactory are here enumerated, and all require careful watching, alteration according to circumstances and persistence in their application whenever improvement, however slight, is being obtained from them.

The treatment of diffuse cases with much scaling is often beneficially initiated by vigorous washing with hot water and soft soap, the scalp being carefully dried afterwards; pure turpentine is then poured over it till pain—usually described by the child as "nipping"—is complained of. The turpentine is then rapidly washed off, the head being again thoroughly dried. Colourless tincture of iodine is then painted over it. This

treatment may be repeated in two or three days according to the amount of follicular dermatitis set up. Usually a large number of hairs with root-sheath attached are loosened by it, and may be removed by subsequent washing. One or other of the following ointments, diluted or concentrated according to the results produced, may be vigorously rubbed into the scalp for ten minutes night and morning. In all lanolin is of special value as a basis, as it facilitates deep penetration of the active parasiticide ingredient, but it must be combined with olive or almond oil to obtain a workable and pleasant consistence. Salicylic acid (gr. x to ʒj ad ʒj), appears, to the writer, perhaps the most satisfactory and agreeable and manageable of all remedies. The pure oleates of copper (gr. xxx to ʒij ad ʒj) and of mercury (ʒj to ʒij ad ʒj), are also very valuable. Although the former is possibly the more active parasiticide, its bright green colour is in many instances objected to, and it seems more prone to provoke unduly severe dermatitis than the latter. Another useful and popular ointment—the “compound citrine ointment”—is composed as follows:—*R* Acidi carbonici (Calvert's No. 2), ung. hydrargyri nitratis, ung. sulphuris aa partes æquales; it must be made without the use of heat, the citrine ointment being rubbed into a mixture of the other two ingredients. It is best used to more limited areas of disease than the preceding.

In *active spreading inflammatory ringworm* the following lotion is often useful by producing a sort of artificial seborrhœa:—*R* Acidi boracici ʒj, ætheris ʒss, spiritum vini rectificatum ad ʒvj. In similar circumstances a method of treatment advocated by Dr. Jamieson seems sometimes serviceable; this consists in washing the head with soft soap twice daily, carefully drying, then sponging on dilute acetic acid and, while the scalp is still wet, sopping it with the following lotion: *R* Sodii hyposulphitis ʒvj, glycerini ʒjss, aquam destillatam ad ʒvj; the nascent sulphurous acid thereby produced seems to act with more certainty and vigour than an ordinary aqueous solution. It must be confessed, however, that the results from various lotions containing the theoretically plausible solvents and penetrants (chloroform, ether, liquor potassæ, &c.) have proved very disappointing.

In *patchy cases* other methods of treatment are preferable. In quite recent

cases blistering with acetic acid, liquor epispasticus or a solution of corrosive sublimate (gr. iv ad ʒj) is often promptly curative, but the tendency of these remedies to provoke acute suppurative inflammation must always be borne in mind and due caution exercised in their application. In very young children where the hair is fine and the patches ringed, speedy cure is generally easily affected by less severe measures—*e.g.*, ammoniated mercury ointment, diluted compound nitrate of mercury ointment or tincture of iodine. To patchy cases, whether recent or old, the treatment by epilation is specially, or perhaps even exclusively applicable. As it is attended with considerable pain it cannot well be employed when dealing with young children, but above the age of six years they can generally be made to stand it. It is usually advisable to deaden the sensibility of the part by the previous prolonged application of glycerine of carbolic acid, or of a 10 per cent. solution of cocaine in oil and lanolin. In other cases the ground may be prepared by ointments of the oleates already mentioned, carefully graduated so as to cause effusion into the follicles short of supuration. After any of these preliminary measures, epilation may be effected either by attacking the hairs singly with fine forceps, a limited area—say half a square inch—being cleared daily, or with large forceps which extract several hairs at a time, but the latter process is the more painful and the less satisfactory. A parasiticide ointment ought subsequently to be well rubbed into the denuded area. Epilation on a large scale may be carried out, as Dr. Crocker suggests, by painting on Coster's paste (*R* Iodi ʒij, olei terebinthinæ decolorati, vel creasoti, vel olei cadini, ʒvj) with a hard brush for three or four days, after which a black crust forms; if this be removed with forceps a large number of diseased hairs are detached. The method is, of course, a rough one, but it may be followed by instrumental epilation, the patch being further prepared by washing with flannel and soft soap. Sometimes excellent results are obtained by covering the patches daily with a solution of salicylic acid in collodion (ʒss-ʒj ad ʒj) after epilation, or independently of it.

In a certain number of very obstinate localized or discrete patchy cases the only effectual means at our disposal is the artificial production of kerion, and this is best accomplished by plunging

into each hair follicle a fine needle previously dipped in croton oil.

Impetiginous inflammation, whether it arise spontaneously or as the result of over-zealous treatment, must be treated on the usual lines, by the removal of scabs, and the use of ammoniated mercury ointment.

Finally, it must be reasserted, that no case ought to be pronounced cured so long as any scaling remains, and until repeated microscopic examination fails to reveal the presence of trichophyton. Even then it is a wise precaution to continue the use of some mild parasiticide ointment for some weeks.

Ringworm of the Beard (*Tinea Sycosis*; *Mentagra vel Sycosis Parasitica*; *Barber's Itch*) is the result of the irritating effect of trichophyton upon the follicles of the hairy portions of the face, the beard and whiskers being very much more frequently attacked than the moustache.

The disease is much commoner than is generally recognized. Sometimes, and especially in children suffering from ringworm of the scalp, it affects the eyebrows. Much more rarely in adults the pubes or other hairy portions of the trunk are attacked. It is especially common in countries where the inhabitants do not habitually shave themselves but patronise a barber for that purpose, the disease being communicated by the soap, shaving-brush or towels rather than by the razor, and in either case some breach of surface (microscopic, it may be) is probably necessary for its communication. This also explains the comparative infrequency of infection from children to adults. In a few recorded cases the disease has been communicated from animals to man.

Eruption.—In persons who wash and shave regularly the disease usually presents itself as circular, scaly, itchy patches or rings in the beard, very rarely on the upper lip. These extend at the periphery and coalesce to form gyrate patches with convex spreading margins often slightly vesicular. In this stage the condition is easily curable, like ringworm of the body. Should its nature not be recognized, or should it be allowed to extend, slight pustular folliculitis supervenes. In less cleanly persons the progress is very rapid; glairy purulent discharge from the follicles becomes abundant, dries up on the surface to form thick crusts matting together the hairs, and violent peri-folliculitis ensues. This leads to the formation

of large red or livid, boggy or brawny lumps, practically identical with "kerion" of the scalp. Pus oozes from the dilated hair follicles of these lumps, and the loosened hairs can be painlessly extracted, this latter point being of diagnostic importance in differentiating the disease from simple follicular sycosis, in which, the inflammation being primarily peri-follicular, the hairs are not detached with the same facility. The frayed broken extremities of the hairs are not so marked a feature as in tinea of the scalp, but the other microscopic appearances are very similar. Generally speaking, the spores are larger than in tinea of the scalp and the mycelium more abundant.

Prognosis.—In cases seen early this is favourable, but old standing cases are remarkably obstinate, and the disease often breaks out afresh after apparent recovery. The cure is frequently followed by patchy baldness, the hair follicles having been irremediably destroyed. The microscope is necessary for absolute differentiation from simple follicular sycosis, eczema and pustular syphiloderma, all of which occasionally closely simulate parasitic sycosis.

Treatment.—Epilation is by far the most important factor in treatment. It is generally advisable to clear an area of about one square inch daily, and the process is comparatively painless, for reasons already explained. After each epilation one of the parasitic ointments mentioned under tinea of the scalp is advantageously employed. A diluted ointment of the red oxide of mercury appears occasionally of special service. A point worthy of note is that poultices do much harm, by causing the disease to spread.

Ringworm of the Body (*Tinea Corporis*; *T. Circinata*; *Herpes Circinatus*) is the condition produced by trichophyton, as it affects those parts of the skin which are only provided with lanugo hairs. It is, of course, of frequent occurrence in children suffering from ringworm of the scalp, and in them, as well as in the great preponderance of adult cases, recovery is easily brought about, and is frequently spontaneous, as the fungus does not find a favourable nidus among the surface epidermic cells. In cases communicated from animals, however, and in the tropics, peculiar virulence is often manifested. The patches are most commonly situated on the neck, face and hands, but may occur anywhere. They are at first sharply defined, circular,

slightly raised, pinkish, and covered with fine grey scales. They partially clear up in the centre, but extend peripherically to form rings, or even occasionally concentric rings, the margin of which is often faintly vesicular and rarely bullous, this latter condition being commonest in young children and in regions (*e.g.*, flexures) where the skin is thin. By the coalescence of adjacent rings and the disappearance of active disease at the points of coalescence, extensive gyrate patches with festooned margins are formed and may occupy large areas. Itching is seldom a prominent symptom.

Eczema Marginatum.—The disease described by Hebra under this name is the most severe form of ringworm of the body. It is rather rare in its most aggravated form, but moderately severe cases are not infrequent in this country. Its seats are the groins, fork, axillæ, and occasionally the popliteal spaces, where the apposition of folds of delicate skin, heat and moisture combine to afford the most suitable conditions for cryptogamic growth, and for the development of secondary dermatitis. The well-defined, festooned, raised margin is usually diagnostic, and microscopic examination of scrapings seldom fails to reveal conidia and mycelium.

Diagnosis.—Ringworm of the body may be mistaken for multiform erythema, pityriasis rosea, psoriasis—especially in young people and of the gyrate form—dermato-syphilis or eczema seborrhœicum corporis, to the separate description of which the reader is referred.

Treatment.—The great majority of mild cases are cured in a week or ten days by a sulphur or ammoniated mercury ointment, or a hyposulphite of soda lotion. The most severe form is, however, very obstinate; for such, salicylic acid is generally the most efficacious remedy, the solution in collodion being used. A 5 to 15 per cent. solution of chrysarobin in liquor gutta perchæ (B.P.), similarly applied, is also very efficacious, but its action must be carefully watched, as it is apt to cause violent dermatitis. Vigorous washing with soft soap followed by ointments of the oleates of copper or mercury is often curative in cases of intermediate severity. J. J. PRINGLE.

RÖTHELN (German Measles; Rubeola).—A specific and infectious eruptive fever, distinct and separate, neither a hybrid of scarlet fever and

measles, nor a modified form of either of those diseases.

The elementary nature of rōtheln has been ascertained by the observation of sequences of cases which have followed its introduction into more or less isolated communities; by which it has also been shown that rōtheln is infectious, that it breeds true, and that one attack of it affords great protection against a second one, but does not protect against scarlet fever or measles. Persons actually suffering from rōtheln have been known to contract scarlet fever, and being exposed to the infection of measles have developed a well-marked attack of that disease. The converse has also happened. In seasonal prevalence, also, it differs markedly from scarlet fever and more slightly from measles. An analysis of upwards of 500 cases which have come under the observation of the writer during a period of eight years shows that the great majority of attacks occur during March, April, May or June, agreeing in this with measles, but differing in that measles has a second period of prevalence in winter. The maximum prevalence of scarlet fever is in autumn.

Rōtheln attacks both children and adults, but as the majority of cases are of a very mild type, of which the infectiousness appears to be slight, many people escape until they have reached maturity, and very many seem to be insusceptible.

The period of incubation is most commonly eleven or twelve days, but not infrequently it extends to fourteen, and in some instances possibly to seventeen days.

Symptoms.—In mild attacks there are often no premonitory symptoms, but those most commonly present are sneezing, lachrymation (which latter, however, much more often follows, or is synchronous with the appearance of the rash than precedes it), and a more or less general enlargement of the superficial lymphatic glands, especially of those on the mastoid processes and behind the sterno-mastoid, and those of the posterior chain, of which the upper ones below the occipital protuberance are the more often perceptibly affected. The glands may be enlarged for some days (in a few instances for from eight to twelve days) before the appearance of the rash. The temperature seldom exceeds 100° F. at any stage of the attack, and is normal in many cases. The appetite for food is scarcely impaired.

Eruption.—This, which is often the

earliest sign of the disease, appears first upon the face and scalp, but quickly spreads to the trunk and limbs, being frequently well marked on the palms of the hands. Its appearance is seldom delayed beyond the second day of the illness. It consists of very slightly raised rose-coloured spots, varying in size from little more than a mere point to $\frac{1}{8}$ inch in diameter. They are scattered thickly and may be arranged in crescents, rings or masses. On their first appearance the spots are separated by intervals of white skin, and the rash is distinctly measly looking, but quickly, often within a few hours, a noteworthy change occurs in many cases. The spots upon the face, which had previously been visible quite up to the edges of the lips, become obscured and sometimes obliterated by an even pink flush, while those on the body are transformed into a more or less punctiform erythema which may very easily be mistaken for the rash of scarlet fever. This change soon spreads to the limbs, and the rash quickly disappears, usually within three days. Slight itching is sometimes complained of. A very slight branny desquamation of the face and neck may follow.

In more severe attacks of r  theln the symptoms are much more like those of measles, the prodromal period sometimes extending to three days, the catarrhal symptoms being much more marked and soreness of the throat seldom absent; the tonsils being red and swollen, and the palate reddened in small patches. The temperature may rise to 104   F., and there may be severe lumbar pain. The rash is darker in colour, the spots are larger, remain separate and distinct, and may leave a brownish or even a purple stain. Broncho-pneumonia and laryngitis have been known to occur as complications.

Melancholia or mania may follow even a mild attack of r  theln, as of morbilli or scarlatina.

Diagnosis.—From scarlet fever it may be distinguished by the measly character of the rash at first and by its appearing on the face and invading the oral circle; by the enlargement of the glands, by the coryza, and by the absence of the characteristic desquamation. In very young children the diagnosis is sometimes rendered difficult by the minuteness of the spots composing the rash.

From measles it is to be differentiated by the usually shorter prodromal period, the enlargement of the glands (nearly always), by the lighter colour and smaller

size of the spots. In some cases the diagnosis from measles is very difficult.

From variola, papular eczema, copaiabarash and urticaria the diagnosis is usually easy, but in a very small minority of cases of r  theln the spots are as much raised and as hard as are the papules of variola.

Prognosis is almost invariably favourable.

Treatment, except of the rare complications above mentioned, is unnecessary. In severe cases the attack should be treated as if it were one of measles.

The enlarged glands soon shrink. If very tender they should be shielded.

E. O. HORWOOD.

ROUND-WORMS.—The *ascaris lumbricoides*, or round-worm, is a nematode similar in shape to the common earth-worm. The head presents three labial papillae, the body is cylindrical, about $\frac{1}{4}$ inch in diameter, varies in length from 9 to 15 inches, and tapers at both ends, but especially towards the tail. The female is considerably longer than the male. The ova are very minute, elliptical and of a dirty brown colour, with a thick nodulated covering, and often exist in immense quantities in the faeces. There must be some intermediary host, presumably an animal that can live in water, for the drinking water has in many cases been proved to be the source of infection in man, but the complete life cycle is unknown. The round-worm lives in the jejunum and feeds on its contents, probably it does not remain more than a few months in the bowel and is then passed per anum; or, it may find its way into the stomach and be expelled by vomiting; occasionally it makes its way into the biliary passages or even into the thoracic or abdominal cavity. It may escape at the nose, or pass into the larynx. A single worm or a large number may be present; usually, however, there are only a few. Children are much more commonly affected than adults.

The *symptoms* are not characteristic; dyspepsia, shooting pains, nasal or anal irritation, may be complained of, and sometimes nausea, vomiting and diarrhoea. When large numbers are present there may be nervous symptoms, such as twitchings or actual convulsions and delirium; these occur especially in neurotic subjects. Death may result from peritonitis, following perforation, or laryngeal obstruction. Not infrequently no symptoms are observed until the child passes the worm.

Treatment.—Santonin in doses of from 1 to 3 grains for a child, or double the dose for an adult, followed by a purge of aloes, scammony, rhubarb or jalap constitutes the best treatment; the drug may be given every day, or occasionally, so long as any ova can be found in the fæces by microscopical examination.

Santonin in medicinal doses occasionally produces symptoms of poisoning, the most prominent being yellow vision (Xanthops) and high-coloured urine; these are less likely to occur if a purgative be given after the drug, and as a rule they quickly subside when the treatment is suspended.

RUPIA.—A superfluous term, but one still in current use to denote a variety of pustular syphiloderm characterized by the formation of large, dirty brown, stratified, conical crusts, like limpet shells. This form of scab is due to

the successive hardening of purulent discharge from the ulcer which is invariably present beneath, and which exhibits the typical foul base and punched-out edge of syphilitic ulcerations. The condition generally occurs in old syphilis, but in a much greater proportion of cases than is usually recognized it shows itself early within the first year. Its precocious development is an expression either of extreme virulence of the syphilitic virus, or of great constitutional depravity on the part of the patient. Scabs or crusts somewhat similar to those of rupia sometimes form in cases of impetigo, or of psoriasis (*P. rupioides*) but the presence and characters of the ulcer of syphilitic rupia easily determine the diagnosis. The scars left by the eruption are deep, at first much pigmented, and indelible. For details of treatment reference must be made to **SYPHILIS OF THE SKIN.** J. J. PRINGLE.

S

SARCINA.—A vegetable organism found in the vomit in gastric disorders of long standing, and especially where the food is retained owing to obstruction of the pylorus, or dilatation of the stomach from atony of the muscular coats.

Sarcinæ are present when the contents of the stomach have undergone a certain amount of putrefactive change, and are not diagnostic of any particular condition or disease. Sarcinæ are also occasionally present in the urine in cases of stricture of the urethra or of enlargement of the prostate.

Under the microscope the organism presents an appearance which has been compared to a corded wool-pack, its component cells being arranged in squares of four, sixteen, or thirty-two. (See Fig. 7, p. 521.) If a drop of liquor potassæ be added to some of the vomit on a slide the recognition of the growth is facilitated.

SCABIES (Itch).—A contagious dermatitis due to the presence of the arachnoid parasite—*sarcoptes* (vel *acar*—*scabiei*).

Description of *Sarcoptes Scabiei*.—The female is visible to the naked eye, is of a pearly white colour and is considerably larger than the male, measuring from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch in length. The body is irregularly circular, the head conical and

armed with four powerful mandibles. A sucker is attached to each of its four short anterior legs and a strong bristle (seta) to each of its four long posterior legs which tilt the animal up and direct the anterior extremity downwards towards the skin. There are also a few



The Female *Sarcoptes Scabiei*.

bristles on the dorsal and ventral aspects of the body, which being directed backwards prevent the egress of the animal from the skin which it has once penetrated. They have a distinct curved

vagina, ovaries, and ovipositor. They pierce the epidermis and when impregnated penetrate deeper into the rete, forming burrows (cuniculi) in which they deposit their ova, probably two or three daily, up to the number of fifty, after which they die, the average duration of their existence being from two to three months. The male is about two-thirds the size of the female, and is provided with distinct testicles and a sucker on each postero-internal leg for purposes of copulation; the penis is supported by a chitinous framework. The male only penetrates the skin after fertilizing the female and in its immediate neighbourhood, where it soon dies.

The ova rapidly segment, becoming larvæ with six legs in about six days. At the end of about three weeks, after two or three moultings, they have eight legs and are sexually mature.

Eruption.—The dermatitis produced by *sarcoptes scabiei* and by the effects of consequent irritation and scratching is characterized by multiform, inflammatory lesions without definite grouping, but sufficiently characteristic in distribution to be generally easily recognisable at a glance. The initial lesion is a burrow, straight or irregularly sinuous, sometimes visible to the naked eye—and always easily discernible with a lens—as a whitish or reddish line with a white spot at the end which represents the insect. The burrows vary from $\frac{1}{8}$ to $\frac{1}{4}$ inch in length, but may be much longer; they are often brownish or black from accumulated ova, fæces, débris, and adherent dirt. The female lies at the distal, closed end, and the oldest, *i.e.*, most mature, ova nearest the entrance, from which they easily escape on maturity, as the surrounding epidermis is exfoliated. The seats of election correspond to those regions where the skin is most delicate and thrown into folds, and are:—the web between the fingers and toes, the inner side and anterior aspect of the wrists, the backs of the hands and forearms, the axillæ, mammæ, front of the abdomen, fork and penis. Only in young children at the breast and in excessively dirty persons are the face and head ever affected. Almost invariably a papular and vesicular rash, intensely itchy at night, results, which in children and unhealthy subjects becomes rapidly pustular and scabby. As the result of scratching, erythematous, urticarial, and “ecthymatous” rashes develop, even where burrows are scarce or perhaps absent; these are especially com-

mon on the anterior surface of the abdomen and thighs and on the buttocks, where scabbing is often a pronounced feature. These secondary lesions are often determined by friction or pressure, *e.g.*, of belts; thus tailors and shoemakers, who are constantly seated on hard boards, have them over the ischial tuberosities, and miners, who work leaning upon one elbow, over the olecranon process.

Diagnosis is generally easy, the polymorphism, distribution, and absence of grouping of the lesions being sufficient to distinguish the great majority of cases of scabies from eczema. The detection of burrows is of importance, and a sarcoptes can generally be discovered in the distal extremity of some of these and easily extracted with the point of a fine needle. In severe cases, however, the burrows may all be torn open by violent scratching, and in children or persons in general bad health their discovery is often rendered very difficult, from rapid vesication and abundant pustulation and scabbing.

Treatment, if carefully carried out, is almost invariably successful in the course of a few days. The burrows must be opened and foreign matters removed from the surface of the skin by a prolonged warm bath every night, followed by thorough soaping, preferably with soft soap, if the skin will stand it. Sulphur ointment (3j ad 3j) may then be applied all over the body in severe, or only to the affected regions in mild, cases; it is frequently prudent or even necessary to dilute the sulphur ointment. The clothes of the patient and the sheets between which he sleeps should be either destroyed or purified in a disinfecting oven, and it is, of course, necessary to treat similarly all persons in intimate contact with the patient suffering from, or even supposed to be suffering from, the disease. The sulphur treatment, if carefully carried out, is almost always effectual in bringing about a cure in three or four days, but is more suitable for public than for private practice as the odour of the ointment is offensive. It often causes severe and obstinate dermatitis which may be mistaken for a persistence of the malady, and it may reveal the nature of the disease, which it may be desirable to conceal from the patient. In place of the sulphur ointment Vlemingx's solution, or the liquor calcii sulphidi, may be painted on at night with a stiff brush and removed by a warm bath in the morning, six or eight hours afterwards. In private practice ointments containing

naphthol (3j or 3jss ad 3j) or styrax (3ij or 3iv ad 3j) are almost as efficacious as the sulphur preparations, do not cause dermatitis, and the former has the advantage of being inodorous.

J. J. PRINGLE.

SCARLET FEVER.—An acute specific infectious fever, characterized by the appearance upon the trunk and limbs of a minutely punctiform scarlet rash, which is followed by desquamation.

The *incubation period* is usually of about three days' duration, but it is said to have been much shorter in some cases and somewhat longer in others.

Symptoms.—The onset is sudden in well-marked cases, but in very mild ones both the pre-eruptive and the succeeding stages of the disease may escape observation.

Pre-eruptive Stage.—The most distinctive symptoms of this period are feverishness, pain and difficulty in swallowing, vomiting or nausea, and a white-furred tongue with red edges and prominent red papillæ; but any or all of them may be absent in very slight attacks, and some of them in more severe ones, although it is probable that in all cases some reddening of the fauces may be seen. Aching pains in the limbs or back may be complained of and there may be well-marked rheumatism even in this stage of the disease. The pulse-rate is much increased. The temperature in simple cases seldom exceeds 103° F. and may tend to fall, but in severe attacks it may be several degrees higher. In the mildest it may not reach 99° F. The state of the tongue is usually as described above, but there may be neither redness nor fur of more than ordinary thickness, nor enlargement of papillæ, conditions which, moreover, are found in cases of disease other than scarlet fever. The tonsils, uvula and soft palate are red, swollen and covered with sticky mucus, or dry and glazed. The inflammation may extend forwards on the covering of the hard palate, even as far as the teeth, or on the other hand, it may be limited to the tonsils, of which the follicles may be distended with secretion, or which may be the seat of abscesses. On the soft palate and uvula small congested points may often be seen, while in other cases the redness is uniform. A soft white film may cover the surface of the tonsils, but it rarely affects the uvula. The glands at the angles of the lower jaw are commonly enlarged. In very severe

attacks diarrhœa may come on at the same time as vomiting.

Drowsiness and listlessness are often among the earliest signs of the disease in children, in whom also delirium at night is not uncommon; but convulsions are rare unless the disease be of a grave type.

As a rule, this stage lasts about twenty-four hours, but it is sometimes much shorter, or may extend to three or four days in very exceptional cases.

The Eruptive Stage.—This is marked by the appearance, first upon the chest and neck, and shortly afterwards upon the rest of the trunk and on the limbs, of a finely punctated scarlet rash. This is not, however, the invariable order, the rash being in some instances seen first upon the limbs, more especially upon the front of the wrists or ankles, on the inner surface of the thighs, or in flexures. It very seldom appears upon the face, the cheeks being merely flushed, while a white ring surrounds the mouth. In a very small minority of cases the rash appears only on isolated tracts, or not at all.

The rash is made up of minute scarlet points lying very close together, separated by skin which is usually normal in colour, but is frequently of a pink or even darker tint. In the latter case, pressure may show that there is a persistent yellow ground-colour. Complete coalescence of the spots may take place; it is commoner on the trunk and thighs than on other parts, and in adults than in children. The elevation of the reddened spots is in most cases microscopic, except on the backs of the hands and feet, in which situations, as also amongst others, in front of the shoulders, minute vesicles may form. In severe cases, the rash is, as a rule, deeper and sometimes purplish in colour, or hæmorrhagic. Even after the fading of a well-marked rash, persistent blood-coloured lines may not uncommonly be found in the folds in front of the elbow, a point which is of some importance diagnostically. In a small percentage of cases there is swelling of the skin of the face; in many only the hands are perceptibly affected. Itching is sometimes complained of, more often when the rash is fading or desquamation is beginning. In the majority of cases the rash reaches its limits by the second or third day, and then fades within a few days, but in very slight attacks it may come and go within a few hours, whilst in severe ones it may not fade for a fortnight. With the rash, or

shortly after it, urticaria, eczema or acute dermatitis may make their appearance in exceptional cases.

Very quickly, often on the first, and usually by the second or third day of the disease, the temperature reaches its highest point, near which, with slight morning remissions, it remains for a period, the length of which depends upon the severity of the attack and the presence or absence of complications. It may not exceed 99° F., or may rise to more than 106° F. If death does not occur the temperature begins to fall, but not so rapidly as it rose, the morning remissions becoming more marked and the evening temperature falling gradually. The pulse-rate may not exceed 80 in very mild attacks, but, as a rule, it is much higher, and in severe cases may be uncountable. Signs of cardiac failure occur early, if the disease be of malignant intensity, but otherwise the heart very rarely appears to suffer, although acute dilatation has sometimes been noticed. Other affections of the circulatory system are rare, but in one case gangrene of the leg followed thrombosis of the femoral artery. Albumen may appear in the urine as during other fevers.

Slight delirium may come on at night, even in mild attacks in children, and during defervescence in adult males. In severe attacks it is often well marked, and may be followed by coma.

The inflammation of the throat may become more intense and, especially in children, may extend to the nose and thence by the Eustachian tube to the ear, or by the lachrymal duct to the eye. In the first case, perforation of the tympanic membrane, suppuration in the mastoid cells and meningitis may follow, and in the second lachrymal fistula, conjunctivitis and even destructive inflammation of the eyeball. The tonsils, soft palate or epiglottis may slough, but the process rarely extends to the larynx and trachea. Stomatitis and glossitis occur only in very exceptional cases, but superficial ulcers often form on the tongue. The glands at the angles of the lower jaw become swollen and abscesses may form in them, or a hard brawny swelling may take place, and either process, but especially the latter, may lead to extensive sloughing or melting away of the tissues of the neck and to hæmorrhage, or to septicæmia, or, more rarely, to pyæmia.

Pain, of a rheumatic character, in joints or muscles is complained of in most cases, and some joints may be swollen

and tender, but the heart is affected much less often than in rheumatic fever.

Pleurisy is of rare occurrence in scarlet fever, and would appear to be due to secondary septicæmia. If liquid be effused it usually rapidly becomes purulent. Bronchitis and broncho-pneumonia, cellulitis and jaundice may have the same septic origin.

Pregnant women do not, as a rule, miscarry when they are affected by this fever.

Desquamation.—After nearly all attacks of scarlet fever, even when there has been no rash, desquamation occurs and may begin as early as the third day of the disease, or not until some weeks later. It is an orderly process which in most cases is completed in from six to seven weeks, in some not for several months and in a very few within a month. It is usually seen first upon the face and neck, especially upon the eyelids and ears, and then in order upon the trunk, shoulders and arms, legs, hands and feet, but in warm moist parts the process may begin out of turn. As a rule, the hands begin to peel during the third week, and the feet during the fourth. The layer of skin may be shed in small scales or in large pieces, separation usually taking place by the widening of the areas of numerous small circles, "pinholes," which first form, but the patches of hard skin upon the hands and feet are in most instances attacked from their edges only, those upon the heels being nearly always the last to fall off.

Sequelæ.—It is while this process is going on, that is to say during the period of convalescence, that certain secondary affections or sequelæ may show themselves, especially in children, of whom the unhealthy and ill-nourished are the more liable to be attacked. There is a marked tendency towards the coupling or association of sequelæ in the same individual. How these affections are caused by an attack of scarlet fever is unknown, but it is conjectured that the elimination of some irritating substance produced by the virus of the disease may account for the nephritis which often follows. The case-incidence of nephritis is increased among scarlatinal patients if they be treated in buildings to which air from drains has access, possibly also in close rooms, and there is a well-marked "family predisposition."

The sequelæ most often met with are

kidney and ear disease and swelling or abscess of the glands at the angles of the lower jaw. More rare is rheumatism (late), and mania and melancholia are still more rare.

The disease of the kidneys (which is commoner among males and in childhood) is as a rule very slight, if indeed the mere presence for a short time of a trace of albumen in the urine may be taken as proof of its existence, but, on the other hand, it may quickly prove fatal. It most commonly commences at the end of the third week. Recovery from it usually takes place, but the disease may pass into the chronic form, although even in that case the patient's health may not be apparently impaired (*see* BRIGHT'S DISEASE, ACUTE).

Ear disease may come on many weeks after the inflammation of the throat has subsided and without there having been discharge from the nose. It rarely occurs in patients over ten years old. Suppuration takes place in the middle ear, and the membrana tympani is perforated. The process is frequently painless.

The disease may extend to the mastoid cells, and the usual serious consequences may follow, but as a rule recovery is complete in healthy persons.

A *relapse*, or true second attack of scarlet fever, occurs in about one-half per cent. of cases at any time from the tenth day of the first attack, and is followed by a second desquamation. It may be of any grade of severity.

Diagnosis.—The differential diagnosis of scarlet fever is a subject of much difficulty and cannot be briefly discussed, nor is mere description of much use. In its onset it most nearly resembles the illness which is sometimes caused by eating shell-fish, &c., in which, however, sore-throat is much rarer and when present is characterized by less swelling of the tonsils and by a more patchy redness of the fauces. The severe scarlatinal sore-throat is most like that caused by "drains," or that which is found in some cases of septicæmia. The "strawberry tongue" is not by any means a constant sign, nor is it diagnostic when present. The rash resembles in character that produced by eating shell-fish, &c., the fading Rôtheln rash, a prodromal variola rash, typhoid roseola, some forms of acute dermatitis, a rash which sometimes accompanies septicæmia, and the more or less punctiform erythematæ produced by various drugs and by other and unknown causes. The occurrence of nephritis or the appear-

ance of characteristic desquamation may confirm the diagnosis of scarlet fever in doubtful cases.

Prognosis.—The disease usually terminates by recovery, but the mortality varies much with age, with social status and with the epidemic type. Of patients under five years of age about 20 per cent. die, whilst above that age the mortality does not as a rule reach 5 per cent., and may be much lower if the prevalent type of disease be a mild one. The records of the London Fever Hospital and of the Hospitals of the Metropolitan Asylums Board show that as a rule the better the social status the better the chance of recovery, and the smaller the probability of complications and sequelæ arising. The prognosis is very grave if signs of collapse show themselves at the onset of the attack, or if there be persistent diarrhoea or vomiting. High temperature is not of itself necessarily dangerous, but if it be accompanied by delirium or coma, the probability of recovery is small, and it is not much greater if high temperature and sloughing of the fauces be associated.

Ætiology.—The *exciting cause* is almost certainly a micro-organism, as to the precise nature of which, however, observers do not agree. It is said to cause a disease in some other animals, especially in cows, whose milk when they are thus affected is believed to have originated scarlet fever in human beings. It appears to be most active in autumn, but whether this be due to meteorological conditions increasing the potency of the germ or the receptivity of the human organism is unknown. At least one-half of the population of this country never contracts scarlet fever. The virus is capable of retaining its vitality for a long time outside the human or other body, but is more easily destroyed by physical and chemical agents than are many other poisons. An attack of scarlet fever affords a large measure of protection against subsequent infection, but is not so effectual as is the case with most of the other acute specific diseases. The infection probably exists in all parts of the bodies of persons affected with the disease, even in its earliest stages, and is given off in all that comes from them, though it does not seem to be carried to any great distance by the air, or at least not in such a way as to be a source of danger. It attaches itself to fomites, and finds a favourable nidus in articles of food, especially in milk. It is not

readily carried from a person affected with scarlet fever to another by means of a third person who is not suffering from the disease, and free dilution with air appears to render it harmless.

The virus may obtain entrance into a house by means of defective drains, the type of disease being made much graver by the combination of poisons. Under such circumstances some of the inmates may suffer from "drain throats" only, and this may account for some of the cases of "scarlatinal sore throat."

The time which must elapse from the beginning of the illness before a patient ceases to be in an infectious state is not known. Instances have been given in which twelve, thirteen, or even fourteen weeks have seemed to be too short; and the continuance of infectiousness has been attributed to delayed completion of desquamation or to persisting discharges from the nose and ears, but it is extremely difficult to exclude imperfect disinfection of hair, clothing, &c., as a possible cause, and in other instances there is evidence that infectiousness has not lasted longer than a few weeks.

Of *predisposing causes* the most powerful is the age of persons exposed to infection. The liability to contract scarlet fever is greatest at about five years of age, and diminishes rapidly from this point onwards. Persons with operation or other wounds, burns, or scalds, and puerperal women appear to be very susceptible, but the subject is a difficult one, owing to the similarity between the rash of scarlet fever and one which not infrequently accompanies septicæmia.

Treatment.—An account of the measures necessary for the prevention of the spread of infection will be found in the article on DISINFECTION.

No means are known by which an attack of scarlet fever can be cut short, and in the most severe form of the disease no treatment is likely to avert a fatal issue, but there appear to be cases in which the scale may be turned in favour of recovery by the use of anti-pyretic measures and by the administration of stimulants. In the large majority of cases all that is necessary is to place the patient under such conditions as will favour his return to health. The room in which he lies should be kept comfortably cool and well ventilated, and, if his temperature be high, the bed-clothing should be light. During the pyrexial period the food given should consist chiefly of milk, which may with advantage be diluted with soda water or have

ice added to it. Cold water in moderate amount need not be forbidden, and the patient may have beaten-up eggs or beef-tea and jellies if he wish for them. In the most severe cases, especially if there be nausea or vomiting, peptonized meat jellies may be of service and the patient must be very carefully fed, rectal alimentation being occasionally necessary. In very mild attacks bread and milk may be allowed. When the fever has abated, appetite for food usually returns quickly, and may be safely satisfied without long delay, a more or less gradual return to full diet being permitted according to the severity of the attack. The time during which the patient is kept in bed need not exceed ten days in most cases. The ordinary ablutions of face, hands, &c., may be performed during the attack, and warm washing-baths be given afterwards (*see* DISINFECTION).

Gargles or sprays of solutions of chlorinated soda, or of chlorate of potash and hydrochloric acid, or of boric acid, may be used with a view to diminish the soreness of the throat. If the pain in swallowing be very great, a few drops of a 4-per-cent. solution of hydrochlorate of cocaine may be sprayed into the throat at intervals, care being taken that the total amount applied be not great. In some cases the pain seems to be lessened by warm water gargles, in others by sucking ice. Children who will not allow remedies to be applied to their throats unless force be used will often permit a powder, consisting of chlorate of potash, bicarbonate of soda, and borax, well sweetened with saccharine or sugar, to be placed on their tongues or between their lips whilst they sleep. The chlorate of potash may be omitted.

It may be said of the other complications and sequelæ generally that they may be treated as if they had arisen independently of scarlatina.

E. O. HOPWOOD.

SCIATICA.—This term is often used to designate pain in the district of the sciatic nerve, whatever its causation may be. Some, however, restrict its application to sciatic pain of primary nerve origin, but it seems better, while recognizing their secondary nature, to include also those cases in which the nerve is affected in the course of pelvic and other diseases.

Symptoms.—Primary sciatica is generally gradual in its onset, but in some cases is rather suddenly developed and attended with a certain amount of con-

stitutional disturbance and slight pyrexia. Pain is referred to the sciatic nerve in any part of its course. It is frequently localized to the upper half of the thigh, sometimes it includes the whole of the main branches, so that the patient is able to map out the general distribution of the nerve, and occasionally the terminal branches in the calf and foot are involved. Tender points may be found in the course of the nerve at some or other of the following positions:—the posterior inferior spine of the ilium, midway between the tuber ischii and the great trochanter, middle of the thigh, popliteal space, behind the head of the fibula and external malleolus. In certain cases the nerve becomes tender throughout its whole course.

The character of the pain generally differs considerably from that of ordinary neuralgia. It is not paroxysmal and subject to periods of complete remission, but usually constant, and described as heavy, burning and gnawing, and sometimes as darting and shooting. It may be so slight as only to be noticed after sitting in a cramped and confined position for a long time, or so severe that the patient is bedridden, and sleep is only obtained by means of narcotics. Exacerbations of the pain may occur and these may be spontaneous or induced by muscular movement. To prevent the latter as much as possible the joints of the affected limb are in the slighter cases flexed a little, and the patient walks on the toes, bearing most of his weight on a stick. In severe cases, the flexion is carried to a greater degree, and intense pain may be caused by any attempt at extension of the limb. Sometimes, though rarely, the pain seems reflected to the sciatic of the opposite side, to branches of the lumbar plexus, or even more distant nerves; it may be, however, that these are all involved in the same morbid process.

Other evidences of disordered sensation are frequently present, and consist of a feeling of pins and needles, numbness or tingling in the area of the distribution of the nerve, and sometimes of irregular patches of anæsthesia. The occasional occurrence of herpetiform eruptions may perhaps be ascribed to an abnormal trophic state and the frequent coldness of the limb to vaso-motor changes.

There is sometimes a considerable amount of muscular wasting, which is apparent in the buttock, back of the thigh or leg. This is not the result of disuse, but dependent upon an actual

paretic condition of the muscles, for it is often noticed soon after the development of symptoms and the faradaic excitability of the muscles may be much diminished, although the reaction of degeneration is very rarely obtained. Fibrillary tremors sometimes occur in the affected muscles, and painful cramps may add to the distress of the patient.

The *course and duration* of the disease vary considerably in different cases. Sometimes the attack is mild, the pain is never severe and passes off in a few weeks; or it may persist for years and be liable to slight exacerbations and remissions. In the severe cases of almost sudden onset, the patient experiences the most agonizing pain and speedily becomes bedridden; all the joints of the limb are rigidly flexed and the muscles waste. Such a condition may continue almost unchanged for months in spite of all treatment, or be subject to remissions and relapses. Recurrences of the disease, in which the same sciatic nerve or that of the opposite side is affected, are not at all infrequent.

In cases of secondary sciatica, pain is generally present in both lower extremities, and is experienced not so much in the main trunk of the nerve as its distribution.

Diagnosis.—Considerable difference of opinion has existed in regard to the nature of primary sciatica, which has been considered by some as always a pure neuralgia, and by others as more often inflammatory. Most, perhaps, will now admit that it is sometimes a neuralgia, but that far more frequently it is due to a perineuritis. If so, to the latter condition probably belong all those cases in which the nerve is tender to pressure, and patches of anæsthesia and other sensory and motor disturbances are present. The neuralgic variety would thus be limited to cases in which the pain was more typically neuralgic in character and referred more to the distribution of the nerve than its main trunk. Intermediate cases will occur, which it is impossible to refer positively to either class. If the symptoms of sciatica be borne in mind there is not much danger of mistaking it for diseases of neighbouring parts. In morbus coxæ there is neither painfulness of the nerve, nor tender spots in its course, but pressure on the great trochanter elicits pain, which is not obtained in sciatica. Similarly with sacro-iliac disease, in which pain is caused by pressure on the joint.

Myalgic pain is characterized by occurring only when the affected muscles are put in action. The lightning pains of tabes dorsalis are paroxysmal and fugitive, and other evidences of that disease will probably be found—*e.g.*, the Argyll-Robertson pupil and loss of knee jerks. Secondary sciatica is distinguished from the primary variety by its pain being often bilateral and referred rather to the peripheral distribution of the nerve than its trunk. Both these points should lead to a suspicion of pelvic disease, and suggest a rectal examination.

Prognosis.—Primary sciatica is not attended with any danger to life, but a very cautious opinion should be expressed as to the probable duration of the disease, for not only do the acute cases run a long course, but they are often subject to relapses and recurrences. The prognosis of secondary sciatica must depend upon its probable causation.

Pathology.—Although it can scarcely be doubted that neuralgia may be referred to the sciatic nerve, as it is to various other nerves, yet the weight of evidence, both clinical and pathological, seems to show that nearly all cases of primary sciatica depend upon a perineuritis, which may spread along the interstitial tissue and cause the nerve-fibres themselves to be affected. Some however, still hold to the opinion that sciatica is a pure neuralgia, whose symptoms are modified by the large size of the nerve, its superficial course and its proneness to mechanical irritation.

Ætiology.—Sciatica is a disease of adult life, most common at forty to fifty years of age, and attacking men far more frequently than women, probably in the proportion of four to one. It is often associated with gout and rheumatism, and has also been ascribed to syphilis and malaria, but in some cases no predisposing cause can be obtained. Exposure to cold is by far the commonest exciting cause, and in some cases over-exertion of the lower extremities seems to have elicited the disease. Secondary sciatica is usually the result of disease of the hip-joint or its neighbourhood, and tumours of the sacrum or os innominatum pressing on the sacral plexus. It may also occur in the course of cancer of the spine and tumour of the cauda equina.

Treatment.—It is always necessary to give the affected limb complete rest, which is sufficiently obtained in slighter cases by the recumbent position on a couch; in the acuter forms of the disease it is desirable to keep the patient in bed,

and in very severe and protracted cases a water-bed affords much comfort. Any constitutional disease, which may be supposed to underlie the affection, must be appropriately treated. Of these the most frequent is gout, for which alkalies, colchicum and iodide of potassium may be given as well as saline purgatives. Salicylate of soda does not often seem to afford much relief, but may be given when the rheumatic diathesis is pronounced. Syphilis and malaria must be treated with iodide of potassium and quinine respectively. The hypodermic injection of morphia becomes necessary to relieve the exquisite pain of the acute cases, but on account of the frequent long duration of the illness, it is essential to take precautions for preventing the development of the morphia-habit. For this reason the patient himself should not be trusted with the performance of the operation, and the dose should be kept as small as possible. This is the more important since a very small dose is sufficient in some cases to relieve the pain. The needle may be thrust into the nerve so as to combine with the sedative action what good may result from acupuncture. Cocaine may be similarly injected and sometimes affords considerable relief in doses of $\frac{1}{4}$ to $\frac{1}{2}$ gr. Many local applications are recommended. In mild cases, stimulating liniments, such as belladonna, chloroform and aconite, sometimes prove useful rubbed along the course of the nerve, but counter-irritation of the same region, by means of mustard plasters or flying blisters, is far more effective. Hot linseed poultices applied to the seat of pain are often soothing at the commencement of an acute attack. In the later stages galvanisation may be employed with advantage. It is necessary that the whole length of the nerve should be brought as far as possible under its influence, and for this purpose a large flat electrode is placed over the sciatic notch, and a smaller one successively over different points of the nerve and its distribution. Another method consists in placing one electrode over the sacrum, and the other in a tub of salt water, in which is the patient's foot. In each case the current is gradually turned on, two cells at a time, till from twenty to forty are in operation, the number depending on the fatness and tolerance of the patient. The application should continue for five to ten minutes, when the number of cells must be gradually diminished to zero, in order to avoid giving an unpleasant

and undesirable shock to the patient. In cases of considerable muscular wasting, the affected limb may be gently rubbed once or twice a day, or the muscles may be roused to action by a gentle interrupted voltaic current. In chronic and inveterate cases, acupuncture may be tried, although it is not often attended with marked success. Appropriate needles, two to four in number, are thrust in at the painful spots to a depth of one to two inches, and, if possible, into the nerve itself, where they are allowed to remain half an hour to two hours. The operation of nerve-stretching is sometimes attended with relief of the symptoms.

WM. GAY.

SCLEREMA NEONATORUM.

—A disease characterized by the development of extensive areas of induration or of hard patches in the true skin. The disease is either present at birth or develops in the few days succeeding it.

The colour of the skin over the affected parts is generally bluish-red; a fold of skin cannot be picked up by the fingers and thumb owing to the stiffening and thickening. It appears as if mummified, is hard, tense and shiny, but does not pit on pressure. The region of the shoulders and buttocks is very often affected; the extensor surface of the limbs and the back of the trunk are more affected than the thin-skinned flexor surface; the face is not often much involved; in one case symmetrical indurations existed in the cheeks; in another a patch was situated over the left parotid gland.

The lesions spread at varying rates and in such a manner as sometimes to involve large tracts of skin; indeed, the induration may affect the whole trunk, rendering it rigid.

The temperature of the body tends to fall in sclerema, especially if the debility progresses. The mode of dying may be by convulsions, diarrhœa, syncope, or asphyxia.

Many cases are congenital in date and rapidly prove fatal from asthenia, the cry gradually growing weaker and sucking being impossible from the rigidity of the lips. In these atelectasis pulmonum is often found. All cases are not rapidly fatal, sometimes the spread of the induration is very slow, there being no weakness of the heart or lungs, and the voice remaining strong.

The writer has had under observation the cases of three female children in one family who were affected fatally with a

chronic sclerema and paralysis simulating "infantile palsy."

Sclerema may be associated with œdema of the subcutaneous tissues, but in pure œdema neonatorum the course of the disease is like any case of cardiac dropsy, and no doubt it is the expression of cardiac weakness.

Morbid Anatomy.—The epidermic layers are normal, the rete and corium thinned, and the connective tissue dense and compressed.

Parrot described sclerema in cases of rapid athrepsia (marasmus).

Treatment consists in maintaining the vitality by warmth and stimulation. The body should be swathed in a cotton wool dress; washing of the skin should be done so as to cause as little exposure as possible. The mechanical nurse or *couveuse* should prove valuable. Brandy in five-drop doses should be given in real tea, or in whey. Vomiting and indigestion have to be contended with by the use of peppermint, aniseed or dill, given cold with a little brandy. The debility may be so great that sucking is impossible, if so the food should be placed at the back of the throat by means of a small spoon, or it may be syringed into this region, or it may be inserted into the rectum.

The inunction of camphorated or olive oil into the indurated patches does good, especially in the chronic cases which can be restored to health. Warmth is certainly beneficial.

In two cases the recovery appeared to be promoted by the inunction of mercury.

ANGEL MONEY.

SCLERODERMA.—A rare disease occurring chiefly in adults, in which the skin becomes hard and bound down tightly to the subjacent tissues. It occurs in two distinct forms—diffuse and circumscribed, but these may co-exist, and there are so many connecting links that it is impossible to consider them as separate and distinct diseases. There are, however, generally, considerable differences in their clinical characters, and the two types are here described separately.

Circumscribed Scleroderma (*Morphea*; *Keloid of Addison*) is the less rare form. It occurs more frequently in females than in males, and especially in early adult life. Its commonest seats are about the breasts and neck. The patches often show marked nervous distribution, those on the trunk following the course of the intercostal or lumbar

nerves and terminating abruptly at the middle line; those on the face usually occurring in the distribution of the supra-orbital or some other branch of the fifth nerve; those on the limbs being longitudinal in the direction of the principal cutaneous nerves. Their locality may also be determined by injuries, friction or pressure (*e.g.*, of clothes, stays, garters). The subjects of the affection are very often neurotic, and its development frequently follows mental shock or anxiety.

The first appearance of the disease is generally unaccompanied by subjective symptoms and its discovery, unless situate upon an exposed part, is often accidental, but occasionally slight itching or discomfort attracts attention to the part. A characteristic patch is at first slightly elevated above the general surface, and is pink in colour, but it soon subsides to the skin level or below it; its form is often roughly circular or oval; the outline is generally irregularly tongued or sinuous, but well defined, and outside it there is a marked zone of pink, lilac, or purple colour due to minute capillary telangiectases. The size of the patch or patches usually varies from that of a coin to the palm of the hand, but they may be more punctate, the size of a split pea or smaller (*macule atrophice*) or, on the other hand, as large as a dinner plate. Their surface is smooth, devoid of hair, of a waxy, dead yellowish or ivory-white colour, the pinkness previously noted being of brief duration. They are firm, brawny, and inelastic to the touch, and the skin is picked up with some little difficulty. Sensibility is seldom markedly affected, but sometimes there is anaesthesia, sometimes hyperaesthesia and pain. Sweat secretion is usually diminished or arrested, the results being some dryness, desquamation and cracking. Extension of the disease occurs by the development at the periphery of small, circular, atrophic spots, which ultimately coalesce with the original patch. In other cases, especially upon the limbs and in young subjects, the distribution of the disease is in longitudinal, depressed, cicatricial-like bands or stripes, the minutest forms of are represented by *lineae atrophice*. The more marked examples often cross joints and fix them, being bounded on either side by infiltrated and hyperaemic skin.

The disease is characterized by the infinite variety of its objective characters, clinical history and associated pheno-

mena. Thus the patches may be single or multiple; depressed, flat or considerably elevated and bossy; symmetrical or asymmetrical. Their size and distribution vary widely in different cases, as well as the subjective symptoms (itching and pain) attending them. In old standing cases there may be considerable brown pigmentation round about. The patches may develop and disappear rapidly, in the course of a few days or weeks, or may persist for months and years. Recovery is often ultimately perfect, as fatty degeneration and absorption of the new cell products occur, but on the other hand a permanently atrophic patch of parchment-like skin may be left. The disease may be associated with atrophy of subjacent muscles, unilateral atrophy of the face, alopecia areata, canities, and other tropho-neurotic conditions.

The *differential diagnosis* of the patchy form must be established from leucoderma, anaesthetic leprosy and true keloid of Alibert; that of the linear form from *lineae albicantes*.

Pathology.—We owe all our positive knowledge of this to Dr. Crocker, who thus sums it up:—"The pathology appears to be that, owing probably to some defect in innervation, an exudation occurs round the vessels, narrowing the lumen, obstructing therefore the blood-flow and leading to thrombosis and sometimes to a real rupture and effusion. Each atrophic spot seen near a growing patch is the base of a cone from which the blood supply is cut off, the violet zone being due to collateral hyperaemia round an anaemic area. The patch, or atrophic spot, thickens by the fibrillation of the effused cells. Where the arterial supply is completely cut off, an atrophic spot is produced; where it is merely diminished partial atrophy with connective tissue hyperplasia or morphæa is the result."

Diffuse Symmetrical Scleroderma (*Scleroma*; *Scleriosis*) is an even rarer condition than the preceding. It is also much commoner in women than in men, and occurs especially in early adult life. It begins by a dense infiltration and thickening of the skin, which gives rise to a sensation of stiffness, almost always first noticed at some point above the level of the waist, and most commonly about the shoulders, back of the neck, chest or arms. Sometimes there is antecedent oedema, with pitting on pressure, the duration of which may vary within wide limits. At the onset of the disease there may or may not be

slight elevation of the local temperature, according to the amount of erythema present but, as a rule, it is not marked. The spread of the condition varies much in rapidity in different cases, but generally it extends over a period of months or years; it occurs by periodic exacerbations, the whole of the arms, neck, scalp, face, and upper half of the trunk being ultimately involved; it is also usually present, although to a less degree, on the feet and legs, but it is stated that the lower extremities are never involved alone. The skin becomes intensely hard, stretched, devoid of its natural furrows and wrinkles, and cannot be picked up from the tissues beneath. Its surface is generally smooth and glossy, but sometimes is drier than natural, desquamating and cracked, owing to the diminished secretion of sweat and sebum. Its colour may deviate but little from the normal, or it may be pink, purplish, fawn-coloured, deep brown, or mottled, while the parts where the pathological process is most advanced and the vessels completely strangulated are quite white. Here and there over the affected area are groups or tufts of teleangiectases. The surface temperature is now usually a little below normal. The margin of the diseased area may be well defined and easily seen, or only determined by the sense of touch. Not infrequently itching is a troublesome symptom, but sensibility is seldom affected. Pain and tightness are the subjective sensations generally complained of. The size and appearance of the affected portion of the skin, as well as the subjective symptoms, are liable to considerable variations from day to day, dependent perhaps chiefly upon external temperature, the effects of cold—to which the patients are peculiarly susceptible—being especially deleterious. The joints, over which the skin has a peculiar tendency to be involved, become fixed in a position of semiflexion, the hands being clawed, the patient becoming literally hide-bound. Ulceration is very apt to occur over the articulations from over-stretching or from pressure. The limbs shrivel and become of ivory-like hardness, but the palms and soles almost always remain unaffected. The face becomes absolutely fixed and expressionless, owing to obliteration of its natural lines, and thus some old and middle-aged persons appear rejuvenated; ultimately the eyelids are fixed, the mouth motionless, and the patient may die of starvation from incapacity to take or masticate food. On

the trunk the process extends to the intermuscular connective tissue or the muscles themselves undergo atrophy; thus respiration becomes embarrassed, the patient often dying of bronchitis and asphyxia. In a few cases the mucous membrane of the mouth and pharynx has been involved.

Dr. Crocker maintains that the cases preceded or ushered in by cedema inevitably go on to irremediable atrophy, while those which begin by tense solid infiltration have a decided tendency to clear up sooner or later, the skin ultimately resuming its natural fineness, softness, and elasticity. In all cases the process is very slow and interrupted, and the patients are prone to be carried off by intercurrent diseases, especially nephritis, pneumonia, and bronchitis.

No difficulty in *diagnosis* can possibly arise, except when the case is seen in the initial cedematous stage, and at that period no definite diagnosis can be established.

Pathology.—Of the nature of scleroderma we know nothing, but there is undoubtedly a close relationship between it and the condition we term rheumatism, the latter disease frequently preceding or being associated with it. In other cases evidences of endocarditis are present, or so-called rheumatic nodules. Exposure to cold and privation are probably responsible for the occurrences of a certain number of cases, but the majority remain totally unexplained.

The morbid *microscopic appearances* are found in the corium and subjacent connective tissue, and comprise dense accumulation of cells of doubtful nature round the blood-vessels, which they compress, and may even obliterate, and especially round the sweat and sebaceous glands—which they ultimately destroy—and the production of excessively abundant and dense connective tissue.

Treatment.—The patient should be clothed in flannel, and take every possible precaution against exposure to cold or draughts. Turkish baths give, at all events, a temporary sense of comfort, probably by promoting sweating, as well as by the shampooing. If they cannot be procured, vigorous rubbing and the inunction of oils of any sort impart some suppleness to the skin. Galvanism is certainly of use in some localized cases. No drug administered internally is of the slightest service.

J. J. PRINGLE.

SCROFULODERMA (Strumous or Scrofulous Ulceration of the Skin).—A clinical term used to describe a number of cases of true tubercular disease of the skin attended with ulceration, and intermediate in point of acuteness between lupus and acute tuberculosis.

Strumous ulceration usually occurs in children or young persons, but is liable to recur in more advanced life. Its subjects almost always exhibit the aspect and other evidences of the strumous diathesis. It may affect almost any part of the body, but its commonest site is the neck, where its first manifestations are found in the submaxillary or nuchal or post-sterno-mastoid lymphatic glands. These are enlarged, hard and indolent, seldom tender; slowly the caseous matter, of which the masses are mainly composed, softens, breaks down and suppurates. The skin above becomes implicated, adherent, red or purple, and inflamed; numerous sinuses, through which gummy pus is discharged, riddle and undermine it in all directions. In other instances the initial nodules are formed in the subcutaneous or cutaneous lymphatic tissue, but they follow the same course as those originating in glands. Ultimately large unhealthy ulcers are formed with steep or overhanging edges which, if they spread at all, do so very slowly. In form they are often oval: their surface, which bleeds readily, is uneven and covered with luxuriant, pale granulations and pus, which dries up to form thin, brown or yellow crusts. Various such lesions often co-exist or occur successively on different parts of the body. There is little tendency to spontaneous cure, but they generally yield rapidly to appropriate treatment, when the scars left are often thick, hard, nodular and very disfiguring.

The *pathology* is similar to that of lupus, from which there is no advantage in differentiating it. Congenital syphilis may closely simulate scrofuloderma and must be eliminated, but careful examination of all the features of any given case makes its nature clear.

Treatment.—Constitutional remedies in a certain proportion of cases are by themselves curative. The food must be digestible and nourishing, butchers' meat with plenty of fat being specially recommended. Eggs, milk and cream ought to be given freely. Good hygienic surroundings should be provided, and sea air is especially beneficial.

Cod-liver oil, arsenic, iodides and ferruginous tonics are all of real service, and may be administered separately or

collectively in combination with the employment of local measures. The remains of caseous glands should be removed by scraping. Ulcers may be washed with mild mercurial lotions and afterwards dusted with iodoform or iodol.

J. J. PRINGLE.

SCURVY (Scorbutus).—A disease due to imperfect diet, chiefly characterized by anæmia, a swollen spongy condition of the gums, and by the occurrence of hæmorrhages in the skin.

Symptoms.—The disease is somewhat insidious in onset, the characteristic symptoms of the scorbutic state being preceded by a period in which the patient suffers from languor, lassitude, debility, and pains in the limbs, whilst his complexion assumes a sallow, cachectic appearance. He may be listless and drowsy but has no fever. In a few days, petechiæ appear, generally (as in all purpuric affections) first upon the lower extremities. It is pointed out as characteristic of scurvy that the hæmorrhage occurs mainly at the orifices of the hair follicles. As the disease advances the purpuric condition extends, and large discoloured patches, like bruises, cover the limbs, whilst anæmia becomes more marked, with concomitant dyspnœa. The hæmorrhage may take place in the loose tissue of the eyelids and the face assume a puffy, bloated aspect. Further, hæmorrhage occurs in the deeper tissues, and painful swellings from extravasation into the substance of muscles, possibly unattended by any cutaneous discoloration, make their appearance; or there may be hæmorrhagic effusion into joints, or beneath the periosteum. In infantile scurvy hæmorrhage is especially liable to occur in this latter situation and about the epiphysial junctions.

The pathognomonic symptom of scurvy is the spongy, swollen state of the gums around the implantation of the teeth, which may become loose and fall out, the gums bleeding on the slightest touch, and in bad cases, sloughing and ulcerating. This ulcerative stomatitis produces a foul odour of the breath. Ulcers may also form on the limbs where there has been much subcutaneous hæmorrhage.

The constitutional symptoms are those of anæmia. Besides the dyspnœa, which increases in intensity with the progress of the disease, there is a great tendency to syncope. Except in very severe cases, there is not much liability to hæmorrhage into the internal viscera, but there

may be gastro-intestinal hæmorrhage, or pulmonary hæmorrhage. Dysenteric symptoms and pneumonia or gangrene of the lung may complicate the case. Other complications consist mainly in inflammation of serous membranes which may be accompanied by hæmorrhage. Retinal hæmorrhage is not common, at least in milder cases, and hence its occurrence has been attributed to the degree of anæmia produced by the disease rather than to the hæmorrhagic tendency that characterizes it. A remarkable symptom connected with vision is nyctalopia or "night-blindness."

The *course* of scurvy is, as a rule, slow and prolonged, owing to the extreme debility and marked emaciation.

Pathology.—The pathology of scurvy has been made the subject of much speculation. There can be little question that it is essentially a blood disease, and its ætiology suggests that there is a deficiency of some element in the blood, which is supplied in fresh vegetable food. Garrod considered that deficiency in potash was the cause, since this element was wanting in scorbutic but present in anti-scorbutic diets. But this theory is not borne out by the treatment of the disease by potash salts. On the other hand the organic acids, which are present in fruits and vegetables, may with even greater reason be the essential factor. Dr. Ralfe, however, from a careful study of the urine, concludes that the essential cause is a diminished alkalinity of the blood. He finds the acidity of the urine is diminished, and that there is a great reduction in the alkaline phosphates, confirming in this respect Garrod's observations on the deficiency of potash salts. Dr. Ralfe's view is, that as the alkalinity of the blood depends upon the carbonates and bicarbonates, the withdrawal from the food of organic salts—such as the lactates, malates, and citrates—from which these carbonates are derived, affords a satisfactory explanation of the dietetic associations of the disease, since, on this view, the blood may be de-alkalised by the introduction of a preponderating excess of acids or acid salts in the food.

Ætiology.—Scurvy is therefore due to an insufficient diet. All other circumstances may be favourable, but if there be a deficiency of vegetable food, scorbutic symptoms may arise. Naturally, the most severe cases of such an affection are to be met with amongst those who are subjected to other depressing influences; but it has been proved that, given the

absence of a proper vegetable diet, exposure to cold and damp are not necessary to its occurrence, although together with other debilitating conditions they may favour it. The most striking examples of its ravages occur in military and naval and Arctic service, where, from defects in commissariat or impossibility of obtaining fresh vegetables, scurvy has at times prevailed to an extreme degree during war or protracted sea voyages. It has occurred also in association with a potato famine, or failure of other vegetable crops, and to a more limited extent in prisons and reformatories, when the diet has been defective in the above particular. Sporadic cases are to be met with in most large towns, and are invariably to be traced to the same essential cause, affecting both young and old alike. Of recent years attention has been drawn to a condition closely analogous to scurvy, and associated with rickets in young infants; this "infantile scurvy" or "scurvy rickets" being also traceable to improper feeding, especially the lack of fresh milk.

Treatment.—There are few diseases which better illustrate the value of appropriate and rational treatment. In the milder cases—such as are now commonly seen—where there may be little but sponginess of gums, slight purpura, with debility and anæmia—recovery is soon brought about by the free use of fresh vegetables and fruit (especially lemons, oranges, &c.), to which may be added the administration of potash salts, the citrate or tartrate, and hæmatinics, as iron or arsenic. Fresh meat in lieu of salted meats, and fresh milk in place of preserved milk, are excellent adjuvants. Indeed, as the cause is largely dietetic—so must the treatment be. Prophylaxis is of the greatest importance, armies in the field and ships should be supplied with tinned vegetables, and fruits, and, when these are inaccessible, with good lime juice. It is astonishing how even severe cases of the disease may be cured by a prompt resort to an anti-scorbutic regimen.

SIDNEY COUPLAND.

SEA-SICKNESS.—Vomiting, excited by the pitching and rolling of a boat or ship at sea.

Symptoms.—There is at first a feeling of gastric uneasiness, intensified by the ingestion of food. This is followed by nausea and a swimming sensation in the head, which may be accompanied with flushing or pallor of the face and sweating. There soon arises not only a dis-

taste for food, but a repulsion from it, and a feeling of nausea is induced by its very smell. These symptoms may be relieved by vomiting, but very often its frequency only increases the distress, especially if the stomach be empty. The vomit is generally very acid, and may be mixed with bile and mucus. At this period everything swallowed is at once ejected. The tongue is now thickly coated, the breath foul, and there is often an excess of salivary secretion. The bowels are, as a rule, obstinately confined, but occasionally there is diarrhoea. The urine is scanty, dark, strong-smelling, with a thick deposit of urates, and sometimes a trace of sugar. The continuance of these symptoms renders the individual wretchedly helpless, he wraps himself in his rugs, for he feels excessively cold, takes no interest in his surroundings, is continually dropping off to sleep, and refuses food. If this go on for long, a period of exhaustion sets in, the pulse becomes very weak, and actual syncope may occur; sometimes a condition of stupor comes on, from which the patient is with difficulty roused. When these symptoms of depression are long continued, the case is one to excite considerable apprehension, for death sometimes results, usually from syncope. Women sometimes abort, and the secretion of milk may be arrested in mothers who are suckling. Such extreme cases are, however, rare, and generally after a few days the symptoms gradually abate, and are followed by a state of mental and physical exhilaration and an enormous appetite. Some people only suffer from a feeling of heaviness, anorexia, and frontal headache, which may be very persistent. Others experience no discomfort at all, and this is particularly true of the extremes of life. As a general rule women are more often and severely affected than men. Sometimes an individual gets so accustomed to the movements of the ship that it takes him some time to recover his land legs, and in rare cases vomiting and retching occur upon landing. The writer has been assured by two or three people that their return to terra firma is accompanied with severer symptoms of sea-sickness than they experience during a voyage. Retching and vomiting may continue for some time after landing from a short and boisterous voyage.

Prognosis.—Complete recovery may generally be expected in from three to five days; but very severe cases often give rise to considerable anxiety.

Pathology.—Many opinions are held in regard to the nature of sea-sickness. Some believe that the pitching and rolling of the ship cause disturbances of the endolymph in the semicircular canals, giving rise to erroneous impressions, which induce vertigo. Others would ascribe the condition to an active hyperæmia of the semicircular canals. Another theory refers the symptoms to a congestion of the centres of the cord and medulla, which renders them more excitable and sensitive to reflex influences. In this manner the vomiting, constriction of arterioles and increased flow of mucus to the stomach and intestine are explained. Such are a few of the many theories which have been suggested. In considering the pathology of sea-sickness, it is essential to remember that similar, if not identical, symptoms may occur under circumstances in which an individual's relationship to surrounding objects is not quite clear. In this way many people cannot enjoy a swing, and some experience a mild form of "sea-sickness" whenever they travel by train. Others are so far unable to adapt themselves to new conditions that not only is their gait uncertain upon landing, but they may even feel sick and actually vomit. All these cases are probably explained by the fact that equilibrium and the conception of relationship to space are maintained by a most delicate co-ordination of impulses from very numerous and widely separated parts of the body, and that in some people the slightest disturbance of these impressions is sufficient to cause a feeling of uncertainty and insecurity, which results in vertiginous sensations, nausea and vomiting. So marked may be this want of adaptability to varying external conditions, that imagination alone may give rise to symptoms of sea-sickness, as is shown by its occasional occurrence before the ship has left dock. According to this view, the sickness of *mal de mer* differs only in degree from that induced by swinging, &c.

Treatment.—This must be conducted on general principles, for although most new remedies are vaunted as specifics, none of them really deserve the title. A seat in one of the warmest parts of the deck should be chosen, not only because fresh air is desirable, but objects are seen on a larger scale there, and appear therefore less "out of joint." Some people who can remain on deck all day vomit only when they get up and go to bed, because they are then in the con-

finer area of their cabin, where all the movements of the ship appear exaggerated, since they are seen within a small compass. When the patient is unable to leave his cabin, he should lie in his berth on his back, and keep his head low. The obstinate constipation should be treated with aperients and the dyspepsia of the early stages, if necessary, with alkalies or prussic acid and diffusible stimulants, but in the later stages of long protracted cases acids are indicated. Opium or the hypodermic injection of morphia is sometimes useful by procuring a prolonged rest. It is very difficult to overcome the distaste for food, but it is necessary to insist on some being taken. This is best administered in a fluid or semi-fluid form, such as beef tea, arrowroot, which should be repeated frequently and in small quantities. Iced champagne is an admirable stimulant, and is frequently tolerated when nothing else can be taken. When the stomach becomes more tractable, cold toast with ham and chicken or other meats may be given. Many drugs, of a more or less specific nature, have been recommended, and are occasionally useful, but very often fail to have the desired effect. Among these may be mentioned the bromides, chloral, nitrate of amyl, nitro-glycerine, cocaine and antipyrine. Dr. Chapman's spinal ice-bag sometimes affords considerable relief to the general symptoms, and alleviates the headache, which may be very distressing.

WM. GAY.

SEBACEOUS GLANDS, DISEASES OF. — Miliun (*Grutum*;

Strophulus Albidus of Willan).—A hemispherical, whitish or pearly projection from the skin, usually about the size of a millet seed, and formed by the accumulation of altered sebum, epithelium, fat and small hairs in a sebaceous gland, the excretory duct of which is obliterated. They often cretify and constitute so-called cutaneous calculi. They are usually multiple; the condition is chronic and painless, and is commonest about the eyelids and forehead, penis and scrotum. The general aetiology is the same as that of acne, but the disease is one of middle rather than of early life. Miliun may occasionally be mistaken for xanthoma or molluscum contagiosum.

Treatment consists in puncturing the sac and expressing its contents; the lining membrane may be scraped or lightly cauterised. Frequent washing

with soap and warm water is a useful preventive measure.

Keratosis pilaris (*Lichen pilaris*, *pityriasis pilaris*).—A chronic, acquired disease of the skin, characterized by the formation of minute, pale, conical elevations about the openings of the hair follicles, caused by the accumulation of sebaceous matter and epithelial cells, and usually enclosing a twisted or stunted hair, the end of which may appear as a dark point. These prominences are greyish or dark from adherent dirt, can be removed from the orifice of the hair follicle, and arise from skin which is usually normal, but may become inflamed. In well-marked cases the skin becomes dry and harsh, feeling like a nutmeg-grater when the hand is passed over it.

The disease is commonest in working men of uncleanly habits, but also occurs in scrofulous children, and as a sequela to pityriasis rubra. It attacks chiefly the extensor surfaces of the thighs, arms and forearms, and frequently also the buttocks and shoulders. It gives rise to no subjective symptoms. The condition closely resembles true, inflammatory lichen pilaris, and congenital ichthyosis follicularis, and must also be distinguished from lichen scrofulosorum, the minute papular syphilide and cutis anserina. It has recently been shown to be due to the presence of pathogenic coccidia or psorospermia.

Treatment consists in vigorous washing with soap and water, and the subsequentunction of glycerine, oil, or a mild petroleum ointment.

Colloid Miliun (*Colloid degeneration of the skin*).—A rare skin affection characterized by the presence of minute, shining, flat or slightly raised lesions of a pale or bright lemon colour, especially on the bridge of the nose, forehead and cheeks, and occasionally on the upper extremities. To touch they are hard and elastic; after incision homogeneous, gelatinous matter can be expressed. The disease affects persons of middle or advanced age. The lesions may disappear spontaneously, or inflame and scab, leaving an ill-defined, often umbilicated scar. They are due either to colloid degeneration of pre-existing miliun bodies, or of the connective tissue of the corium. Xanthoma is the only disease for which this can be mistaken.

Other affections of the sebaceous glands will be found treated under the headings, ACNE, ASTEATOSIS, COMEDONES, SEBORRHOEA.

J. J. PRINGLE.

SEBORRHŒA (Steatorrhœa).—A functional non-inflammatory disorder of the sebaceous glands characterized by the excessive secretion of altered sebum and its accumulation on the skin, along with epithelial debris, in the form of an oily coating, greasy crusts, or fine, branny scales.

The condition may be (1) universal, or (2) local. The vernix caseosa existing at birth may be considered as a physiological seborrhœa, but if it be excessive in quantity, or persist after the first month of life, it becomes pathological.

Universal Seborrhœa is rare; three principal forms are recognized:—

(1) *Seborrhœa squamosa neonatorum* (ichthyosis congenita) in which the accumulated sebum forms thick, yellow plates firmly adherent to the skin and fixing it; deep rhagades form at the articulations, the eyelids are tightly stretched, the lips retracted, causing the gums to be exposed; the fingers, toes and ears are badly developed. The subjects invariably succumb in a few days.

(2) *Seborrhœa universalis (vel pityriasis tabescentium)* occurs only at the end of wasting diseases (e.g. diabetes mellitus), and consists in the existence of a universal, branny desquamation, especially over the trunk and extremities.

(3) *Cutis testacea* is a condition closely resembling ichthyosis hystrix, in which the trunk and extensor surfaces of the extremities are covered with large thick plates of greasy, inspissated sebum, usually greenish or blackish from accumulation of dirt upon them. The subjacent skin is not inflamed, and the sebaceous nature of the disease is clearly shown by the presence of processes from the under surface of the plates penetrating the dilated sebaceous ducts.

Treatment may be conducted on the same lines as for the local forms of seborrhœa.

The various forms of **Local Seborrhœa** are among the commonest skin diseases presenting themselves for treatment. They most frequently develop about the period of puberty, like the other forms of sebaceous disease with which they are often associated, and they affect the female more than the male sex. Occasionally they occur in healthy persons, in which case they are usually very amenable to treatment, but the greatest number of cases arise in persons suffering from anæmia, weak circulation, dyspepsia, menstrual disorders or phthisis. Personal uncleanness strongly predisposes to the disease. Authorities differ

as to whether it is worse in summer or in winter, the majority leaning to the latter view. Many arguments have lately been advanced in favour of the view that this disease is due to a micro-organism, but no definite specific form has yet been detected.

In *Seborrhœa oleosa* the sebaceous discharge is very abundant and gives a glossy or greasy appearance to the skin, or may even form large oily drops upon it, causing a distinctly rancid odour. The condition is physiological among the negro races, but somewhat rare among whites, and affects chiefly brunettes. The nose, forehead, and the bald scalp are the chief seats of the disease; on removing the secretion the openings of the sebaceous gland ducts are seen to be very patulous and the oily discharge rapidly reaccumulates. The condition frequently complicates rosacea, and is specially common in alcoholic subjects.

Seborrhœa sicca is by far the commonest form of the disease; the sebum is secreted less rapidly and in smaller quantity than in seborrhœa oleosa, and is mixed with epithelium from the sebaceous glands and excretory ducts so as to form fine greasy or branny scales; the underlying skin is pale and leaden. No subjective symptoms are present, but decomposition of the sebum may give rise to eczema and itching (*vide ECZEMA SEBORRHŒICUM*). The disease presents certain peculiarities according to its sites.

(1) *Seb. sicca capillitii* (dandruff, pityriasis simplex) is usually diffuse over the whole hairy scalp, but most severe at the vertex. It may be so slight as only to occasion a little furfuraceous scurf, or the secretion may be so abundant as to mat the hairs together. The disease, if of long standing, may cause permanent baldness (alopecia pityrodes vel furfuracea) from destruction of the hair bulbs, and even in mild cases the hair usually falls to some extent. When it extends over the forehead a little eczema is usually set up. The disease must be differentiated from eczema, psoriasis, tinea tonsurans and the secondary squamous syphilide, all of which it usually complicates.

(2) *Seb. faciei* is a common sequela of variola and other exanthemata, and a frequent concomitant of the composite disease rosacea. It affects chiefly the forehead, superciliary regions, sides of the nose and cheeks, and is specially liable to produce secondary eczema. Marked disfigurement is often caused by

the greenish or blackish colour of the scales. Cases in which the plugs of sebum penetrate the patulous excretory ducts simulate closely or may prove to be the early stage of lupus erythematosus, hence the name *seborrhœa congestiva* originally applied to that disease by Hebra.

(3) *Seb. genitalium* consists in the accumulation of smegma beneath the prepuce in males, about the clitoris and between the labia and nymphæ in women. Decomposition of the sebum frequently causes balanitis in the male, and in the female a condition liable to be taken for gonorrhœa.

(4) *Seb. corporis* is the disease formerly described as *Lichen circumscriptus*, *circinatus*, *marginatus*, *annulatus*, *gyratus*, &c. Its characters vary considerably from those of the forms just described. The eruption usually occupies a triangular patch between the scapulæ, the base being directed upwards, and the sternal and clavicular regions; it consists of groups of minute pink papules, which form rings with well-defined margins, spreading centrifugally and coalescing to form gyrate figures. In old-standing and extensive cases, the rings may be only observable at the outside of the patches. In the centre of each ring is a thin, greasy scale frequently detached by the clothing. Persons who wear flannel clothing, and especially those who wear the same night and day, are frequently the subjects of the disease. *Seborrhœa capitis* is almost invariably present, and acne is frequently intermingled with the disease. Moderate itching is usually complained of. The condition has little tendency to cause eczema, except perhaps in rheumatic subjects. The disease is apt to be confounded with *tinea versicolor*, *tinea circinata*, *pityriasis maculata*, and the early circinate syphilide.

Treatment of Seborrhœa.—(1) *Constitutional*; fresh air, exercise and proper feeding must be enjoined. Cod liver oil, iron, arsenic, and the sulphide of calcium are the drugs most generally used.

(2) *Local*; crusts and scales must be softened with rags soaked in diluted liquor potassæ or, preferably, with oil, and removed; in cases of *seborrhœa capillitii* it is as well to apply the oil freely at night and wear a flannel night-cap; then vigorous friction made with an alcoholic solution of soft soap (*spiritus saponis alkalinus* of Hebra) which removes loose hairs and further cleanses and stimulates the skin. Mild astring-

ent ointments containing alum, borax or tannin should then be applied, or more stimulant applications, such as diluted red oxide or white precipitate ointments. The addition to these ointments of salicylic acid or resorcin (2-5 per cent.) is beneficial and prevents decomposition of sebum with its deleterious results. The habitual use of soap containing carbolic acid, sulphur or tar is usually advisable. Should eczema arise as the result of too vigorous treatment, it must be dealt with on general principles.

J. J. PRINGLE.

SEPTIC DISEASES (*Sapræmia*, *Septicæmia*, and *Pyæmia*).—These affections, though usually observed as secondary consequences of wounds or other injuries, occasionally arise under other circumstances, and are therefore briefly noticed here.

In *Sapræmia*, or septic intoxication, the symptoms are produced by the absorption of soluble products of bacterial action. These bacteria are probably those present in ordinary decomposition, and are not themselves capable of surviving or producing any effect in the living blood or tissues.

By *Septicæmia* is to be understood a condition in which the blood becomes itself infected by microbes, ordinarily associated with suppuration. There is no one microbe constantly present; the *staphylococcus pyogenes aureus* or *albus*, or the *streptococcus pyogenes*, may one or all be the active agent in suppuration and in *septicæmia*, but it is probable that the last named is the most malignant, and most often associated with severe *septicæmia*.

Pyæmia is to be regarded as a form of *septicæmia* characterized by the occurrence of multiple or so-called metastatic abscesses. Clinically, no hard-and-fast line can be drawn; pathologically, the microbes found in the blood and in the affected tissues are the same, and the morbid anatomy renders it probable that the essential event in *pyæmia* is the occurrence of phlebitis at the seat of the primary lesion. As this phlebitis is infective, it is reasonable to suppose that particles of the clots in the veins are detached and become impacted in the lungs, or if the radicals of the portal system be the veins involved, in the liver, and there set up a suppurative process.

No organ of the body enjoys immunity, but the most frequent seats of destructive purulent inflammation are

the joints, the pleura and peritoneum, the meninges, the endocardium, the eye, the muscles, the liver, and the spleen. The infective factor is undoubtedly a microbe, the streptococcus pyogenes, or one or both of the two above-mentioned staphylococci. The probable sequence of events is that a minute vessel or capillary becomes plugged by an infective embolus—a collection of cocci, or a clot containing cocci. Each embolus is a focus of inflammation, leading to coagulative necrosis in its immediate neighbourhood, with minute extravasations around. Secondary inflammation ensues about the necrotic focus, and the inflammatory process becomes, through the agency of the pyrogenic cocci, suppurative.

That a very slight wound may be followed by a severe septic disease is a well-established clinical fact, but a satisfactory explanation of it has not yet been afforded by the observations of bacteriologists.

As has been stated already, the microbes found in the most acute forms of septic disease are specifically identical with those present in a trivial furuncle, or in the so-called "laudable pus." Why in certain cases these microbes are the determining cause of so malignant a process as septicæmia or pyæmia is not very clear. In some cases a partial explanation may be found in a neglect of the old maxim: "If there be pus, let it out." In others the debilitated condition of the patient may be a contributory cause. In others, again, the anatomical relation of the parts primarily involved is of importance; this is the case in puerperal fever, and in pyæmia secondary to inflammation of the vermiform appendix. But a considerable proportion of cases remain, in which it seems necessary to suppose that the microbes themselves are more virulent—i.e., possess a greater power of growing and spreading in the tissues, than is ordinarily the case. Some importance may also attach to the dose, that is to say, to the number of microbes reaching the blood from the primary focus.

Symptoms.—The general symptoms of these three varieties of septic disease are described in the article on PUERPERAL FEVER (*q.v.*). Those of sapræmia will not be further discussed, and it will suffice here to point out some of the morbid conditions under which septic diseases are liable to occur as complications, for the proportion of cases in which either septicæmia or pyæmia arises spontaneously is very small, and it is doubtful whether even in these cases the spontaneity is not more apparent than

real. The specific poison may obtain entrance through a slight abrasion of the skin, or through a bed-sore, which may even heal under suitable local treatment while yet the general systemic poisoning progresses; or the point of entrance may be an ulceration of the mucous membrane of the pharynx, intestine, or urethra. The cases in which septicæmia (or more probably, perhaps, pyæmia) seems to be most distinctly spontaneous are examples of *Acute Osteomyelitis*, where without any abrasion of surface, an acute infective process originates within the cancellous structure of the long bones; here, however, a previous traumatism has probably in all cases lowered the vitality of the bony tissue. A specific infection of the endocardium may occur in the course of septicæmia or pyæmia, and may be the intermediate process which converts the former into the latter, but in a considerable proportion of cases the lesion of the endocardium is the most prominent, and, at least appears to be, the primary lesion. Such cases come within the definition of ulcerative or malignant endocarditis (*see HEART, ACUTE DISEASES OF THE VALVES*).

The temperature is of the remittent type; the initial rise in septicæmia is generally sudden and may be accompanied by a rigor; the exacerbations are apt to occur daily in the evening, giving the temperature curve a general resemblance to that of enteric fever. The development of pyæmia is marked by wider fluctuations. The temperature rises rapidly, often to 105°–106° F. during the rigors; the subsequent remission, which is accompanied by copious perspiration, may bring the temperature down below the normal point.

The skin, which soon assumes a sallow or more distinctly icteric tint, may be the seat of minute petechiæ or of larger ecchymoses; an erythematous eruption is frequent, and has been mistaken for that of scarlatina; septic disease is however not an infrequent complication of scarlatina anginosa; roseolar, urticarial, and pustulous eruptions may also be met with.

The pulmonary symptoms, even when abscesses exist, are often obscure; patches of broncho-pneumonia may be discoverable, but the amount of dyspnoea may be out of proportion to the physical signs. Bronchitis is a frequent complication.

The spleen is enlarged at an early stage and may subsequently become the

seat of infarcts which break down into abscesses. Hepatitis occurs with great frequency in those cases in which the primary lesion is within the domain of the portal system; multiple hepatic abscesses and general pyæmia may thus have their origin in suppurating hæmorrhoids, in inflammation of the vermiform appendix, or in ulcerative enteritis. Colliquative diarrhœa is frequently present, and is not always due to enteritis discoverable after death.

The serous cavities may be the seat of purulent inflammation, generally produced by extension from the viscera; thus pericarditis and empyema are common complications.

The renal symptoms vary very widely; an acute septic nephritis with miliary abscesses, or one or more suppurating infarctions may be present, in which case the urine is highly albuminous, and contains casts, or epithelial cells and blood. In other cases, in association with ecchymoses in the substance of the kidneys, or hæmorrhage into the mucous membrane of the pelvis, or miliary abscesses, a small amount of albumen and perhaps traces of blood are present, while in others little or no albumen may be detectable.

The occurrence of suppuration in and about the joints, in the muscles, and aponeuroses, as well as the occurrence of panophthalmitis, are mentioned in connection with the pyæmic form of puerperal fever.

The cerebral symptoms are of the same typhoid character as those produced by other severe and exhausting fevers. More rarely meningitis, cerebral hæmorrhage, or abscess may be observed.

Diagnosis.—The diagnosis of septic disease is usually in the early stages very difficult. The resemblance of certain cases to scarlet fever has already been mentioned; cases of purpura variolosa, that is to say, cases of small-pox, in which before the papular eruption comes out numerous widespread cutaneous ecchymoses appear, have been confounded with septic disease. The true nature of such cases can only be recognized by a careful consideration of their ætiological relations. The same remark applies to those somewhat chronic cases of septicæmia, in which the general prostration, enlarged spleen, diarrhœa and perhaps roseola, present a general resemblance to enteric fever; the history of the case, the character of the stools, and the temperature curve may afford valuable information: care-

ful examination ought also to be made for cutaneous ecchymoses, swelling of the joints, and retinal hæmorrhages.

The resemblance of some cases to acute miliary tuberculosis may lead to considerable difficulty, and in view of the pathological affinities of acute tuberculosis and pyæmia this is not surprising, nor is it always possible to remove all doubt until the development of some distinctive symptom, such as well-marked arthritis or choroidal tubercle.

In those cases of septic disease which present at an early stage arthritis of many joints, endocarditis and high temperature, the diagnosis from acute rheumatism is not at once possible. The effect of salicin in reducing temperature and relieving articular pain is very much more marked in acute rheumatism than in pyæmia and, later on, the occurrence of icterus and cutaneous ecchymoses, of retinal hæmorrhages, of bronchopneumonia, and of marked splenic enlargement will point to pyæmia, though cutaneous ecchymoses and bronchopneumonia are occasionally observed in severe cases of acute rheumatism.

If severe acute nephritis be developed early in the case, it may be impossible to distinguish it from one of acute Bright's disease, and indeed such a case may be in one sense considered to be a variety of acute Bright's disease, with the superadded danger that the inflammation is secondary to an infective inflammation of some other organ or tissue.

Prognosis.—The prognosis of sapræmia is, speaking generally, less favourable than that of septicæmia, since if the cause can be discovered and removed, the poisoning will cease; the prognosis of sapræmia therefore is dependent on the nature of the causative malady. The prognosis of acute severe septicæmia is extremely unfavourable and death may ensue in a few days; in less severe cases, if the primary lesion can be discovered and treated, the prognosis is more hopeful.

When pyæmic abscesses have formed the prospect is much more gloomy, since each such abscess is a fresh focus from which the infective particles may be distributed.

Treatment.—The treatment of sapræmia has already been indicated; it consists in removing the source from which the poisonous matter is derived; the application of this principle to the special case of one form of puerperal fever is fully discussed in the article on that

subject (*see* sub-head Septic Poisoning). The treatment of septicæmia is not hopeful; internal medication is only palliative, but large doses of quinine reduce the temperature, probably conserve the patient's strength and may tend to check the morbid process, but no radical benefit can be hoped from such means. If suppuration be known or surmised to exist in any organ or tissue, exploration at the earliest possible date is advisable. This is the more necessary since it is impossible to say with certainty in the early stage of any case whether it is an instance of sapræmia, or of true septicæmia. Acute pyæmia is almost invariably fatal. Subacute cases, however, occur; in them, especially those in which the earlier abscesses are in easily accessible situations, much may be hoped for from persistent treatment; every abscess must be evacuated and its cavity rendered antiseptic, the patient's strength being maintained by the administration of easily digestible or pre-digested food, and by the exhibition of stimulants (champagne, old port wine) in moderate quantities. DAWSON WILLIAMS.

SINUSES OF THE DURA MATER, THROMBOSIS OF. —

Thrombosis of the cerebral sinuses is undoubtedly favoured by the peculiar conditions under which the venous circulation is carried on within the cranial cavity. These sinuses are little else than channels formed in a fold of the dura mater, and have consequently rigid walls and an unvarying capacity. They must then always contain the same amount of blood, notwithstanding the more or less engorged state of the rest of the venous system. Unlike the rest of the veins the circulation within them is removed from the influence of atmospheric pressure, and of muscular contraction, whilst in the case of some of the sinuses the current is against the influence of gravity. Moreover, in the case of the superior longitudinal sinus and some others the entering veins may have a direction contrary to that of the main current in the sinus. Lastly, some sinuses are curiously traversed by fine trabeculæ which must further retard the flow of blood. Hence of all venous channels in the body the cerebral sinuses are perhaps the most favourably disposed for the spontaneous coagulation of their contents, and there can be no question that such an event comparatively often occurs. But they are also the seat of thrombosis which is secondary to inflammation of their

walls or due to extension of clotting from some of their tributary veins.

Anatomy of the Sinuses.—It may be useful to recall the leading facts of the disposition and relations of these channels, as serving to explain the manner in which they may become thrombosed and also the effects of such obstruction. Some of them are single, others are in pairs. They are usually divided into those of the vertex and those of the base. In the former category are the superior longitudinal, inferior longitudinal, straight, occipital and lateral sinuses: in the latter, the cavernous, circular, transverse, the superior and inferior petrosal sinuses. The blood from all these sinuses finds its way eventually into the jugular veins by the lateral sinuses. Posteriorly there is a confluence of sinuses in the torcular Herophili, whence the lateral sinuses take their origin: similarly, anteriorly the cavernous sinuses receive the petrosal and, through them, communicate with the lateral.

The *superior longitudinal sinus* runs in the upper margin of the falx cerebri, from its anterior extremity at the crista galli, to the torcular Herophili, which is seated at the posterior junction of the falx with the tentorium, opposite to the internal occipital protuberance. There is a groove on the occipital bone indicating the position of this sinus, which is triangular in section, and enlarges in size from before backwards. The sinus is traversed internally by a number of fibrous bands, and at places there may even be seen projections into the sinus of Pacchionian granulations. This sinus receives blood from a large area of the surface of the cerebral hemispheres, and most of the veins opening into the posterior part, have a forward direction, contrary, that is, to the direction of the blood current. Veins from the cranium and the scalp also open into this sinus.

The *inferior longitudinal sinus* is situated in the lower, short margin of the falx, and ends in the *straight sinus*, which runs along the line of junction of the falx and tentorium to open into the torcular. The former receives blood from the inner surfaces of the hemispheres, the latter has the important office of receiving the veins of Galen, as well as veins from the upper surface of the cerebellum.

The *lateral sinus* is partly contained in a wide groove which winds across the occipital and temporal bones, terminat-

ing in the jugular foramen. It is connected with the foregoing sinuses by its junction with the torcular, and receives in its course the occipital and petrosal sinuses whereby it is connected with the cavernous sinus. It is also fed by veins from the cerebellum, from the diploë of the occipital and temporal bones, and it may be especially noted, from the mastoid process of the latter. It terminates in the jugular vein, and is therefore the main channel whereby the blood passes out of the cranial cavity.

The *occipital sinus* runs in the attached border of the falx cerebelli to end in the torcular, and anastomoses anteriorly with the posterior spinal plexuses.

The *cavernous sinus*, so called from its being filled with a delicate spongy mesh-work, is an irregularly shaped sac placed on the side of the sphenoid bone, from the sphenoidal fissure to the apex of the petrous bone. It is of great importance, owing to its receiving the ophthalmic vein, which has such free anastomoses with the facial, nasal and frontal veins: posteriorly it communicates with the petrosal sinuses. It is also remarkable from having its wall traversed by the third, fourth and sixth cranial nerves, and the ophthalmic division of the fifth, and also by the carotid artery.

The *circular sinus* surrounds the pituitary body, and connects the two cavernous sinuses.

The *superior and inferior petrosal sinuses* run respectively along the upper and lower margin of the petrous bone between the cavernous and lateral sinuses, receiving in their course venules from the bones they traverse.

Ætiology of Sinus Thrombosis.—Obstruction of the cerebral sinuses by coagulation of their contained blood during life, may be brought about in several ways. At least two main divisions are met with.

(1) There are cases where thrombosis occurs in the weakly, in states of exhaustion, however produced, such, for example, as are met with in the very young or the aged, from exhausting diarrhoea, in the course of lung disease, or following prolonged fever; and, at other periods of life, in the anæmic, or the subjects of phthisis or cancer. Rarer are to be met with similar spontaneous thromboses in the states of pregnancy or the puerperal period, and perhaps rarest of all, in organic heart disease. It is obvious that these are also conditions which are the most favourable to thrombosis in veins generally. This is not the

place to discuss the general pathology of thrombosis, but it may be pointed out that we have, in these conditions, all the known factors which favour this process. First, there is feebleness in the propelling power of the heart, which is most felt in the cerebral sinuses, and most of all in the superior longitudinal sinus, which is, *par excellence*, the seat of this form of thrombosis. Secondly, there is probably a greater tendency to coagulation of the blood in such conditions (*e.g.*, anæmia, puerperal state), and, thirdly, the nutrition of the vessel wall may share in the lowered vitality, and thus favour coagulation of the blood in contact with it. The essential feature of these cases is the condition of exhaustion or depressed vitality, and hence the term *marantic* applied to this form of thrombosis.

(2) The other form is that which is due to *inflammation* of the vessel wall, and with this may be allied those cases where the thrombosis, originally of phlebotic origin, spreads by continuity into the tributaries of the inflamed vein. Examples of this form abound in the case of the cerebral sinuses. Perhaps the most frequent is thrombosis of the lateral sinus by direct inflammation of the sinus secondary to disease of the temporal bone, and associated with pachymeningitis at the same spot, but often the thrombosis in this sinus is set up by continuity from its tributaries, the venules from the bone itself, or from the petrosal sinuses. Indeed, we may have the sinus blocked by extension of the clotting from the longitudinal sinuses on the one hand, or the cavernous on the other. These latter sinuses may be thrombosed secondarily to phlebitis in connection with the facial, nasal or pterygoid veins, as well as the orbital and ophthalmic veins. Hence it is that cavernous thrombosis may arise as a sequel of erysipelas of the face, or facial carbuncle, alveolar abscess, maxillary periostitis (it has followed extraction of a tooth), injuries or diseases involving the jaws, nose or face, and orbits. Occasionally cavernous thrombosis may arise apparently spontaneously, or may be due to pressure from tumours or aneurysms, which are more often to be found in its vicinity than in that of the other sinuses.

Morbid Anatomy.—From the foregoing it will be seen that the sinuses most likely to be the seat of thrombosis are the superior longitudinal, lateral, and cavernous, and that the first is more liable to marantic, the others to phlebotic

thrombosis. The post-mortem appearances differ somewhat in the two varieties. In *marantic* thrombosis the sinus is filled by a clot, pale, firm, laminated, and but slightly adherent to the wall, unless it have been formed for some time, when it may be undergoing organization. To this clot may be attached more or less coagulum, obviously of more recent date. If, on the other hand, the greater part, or the whole of the sinus has been recently occluded, then the thrombus has a less pale appearance and is less firm. The tributary veins are also distended, and appear as solid cords, from being filled with clot. As before said, the process may extend from one sinus to another, although mostly limited to the superior longitudinal, or to only a portion of this. Owing, however, to the sinus receiving blood from the brain, the portions of this organ, whence the blood stream is thus arrested, undergo red softening. The cortex and centrum ovale will be studded with minute hæmorrhages, and in places there may be considerable sub-arachnoid hæmorrhage. If the straight sinus be blocked, then the softening will involve the basal ganglia, and the ventricles be filled with blood-stained fluid. An excellent illustration of the effects of the thrombosis of the superior longitudinal sinus is to be found in Bright's Medical Reports. The appearances of *phlebitic* thrombosis vary according to the nature of the primary source of inflammation. In the most frequent example—that of inflammation of the lateral sinus secondary to disease of the ear—the conditions are such as to give rise to a septic inflammation. Accordingly, in such cases, the sinus is found to be occupied by a pultaceous, semi-purulent, or ichorous mass, sometimes of greenish-black appearance. This can in great part be washed away by a stream of water, leaving the thick-walled sinus lined by a ragged layer of disorganized clot, except at the extremities, where the channel is occupied by a parti-coloured thrombus. The softened thrombus may extend far down the jugular vein, or, on the other hand, be limited to only a small part of the sinus; it is invariably accompanied by a purulent or adhesive pachymeningitis in its vicinity, or with more wide-spread dura-arachnitis. No situation could well be more favourable for pyæmic infection, and therefore it is common in these cases to meet with pulmonary abscesses, which obviously own this origin, the septic material being conveyed direct to the lung. Of

the other sinuses the most frequent to be the seat of this secondary form of thrombosis is the cavernous, owing to its free venous communications through the ophthalmic vein, as already mentioned. This sinus may indeed be involved by the extension through the petrosal from lateral, and often the thrombosis extends from one cavernous sinus to the other.

Symptoms.—Except in the case of the cavernous sinus, there are no constant or definite symptoms of this condition, and it must be confessed that in the majority of cases its occurrence, although suspected, can hardly be proved during life. This, however, it is justifiable to say, that whenever in a patient who is suffering from marked anæmia, wasting disease, exhaustion, or other state favouring thrombosis, brain symptoms supervene, commencing with headache, often of great and increasing intensity, followed, it may be, by delirium, convulsions, hemiplegia, or other paralyzes, and passing into coma, sinus-thrombosis may reasonably be expected. The headache may occur for days before any other signs arise, and optic neuritis is not usually present. These remarks apply chiefly to the ordinary form of marantic thrombosis—that, namely, in which the *longitudinal* sinus is primarily concerned. The paralytic and other objective phenomena are in this case due to the extension of the process to the cerebral veins, and the resulting hæmorrhage. It depends upon the seat of the latter whether or not there are any convulsive or paralytic symptoms, and that again is determined by the situation and extent of the thrombus. But as regards the *lateral* sinus, it may be said with truth that there are no symptoms directly referable to its occlusion. It is the collateral circumstances that suggest its occurrence. Great and undue distension of the jugular vein on the affected side, and in rare cases actual evidence of the plugging of this vein, with enlargement of its collaterals, would point to involvement of the lateral sinus—*e.g.*, in a case of chronic ear disease. Rigors and other indications of pyæmia may also occur. It is different with thrombosis of the *cavernous* sinus, for owing to its intimate relation to the orbital circulation and the fact that its wall is traversed by certain cranial nerves, its occlusion is generally marked by very definite signs. Amongst these the most constant is proptosis, which may be very slight or produce marked exophthalmos, its occurrence being due, for the most

part, to venous congestion and œdema of the orbital tissues. It may be quite transient, for collateral circulation may become established. When the proptosis is very slight, it may be solely attributable to the paralytic condition of the ocular muscles. Œdema of the eyelids, chemosis, and facial œdema, are associated with thrombosis of the sinus when (as often happens) there is also ophthalmic and facial phlebitis. An enlargement of the frontal veins is sometimes apparent, from the diversion of the blood stream through the orbito-facial anastomosis. Contrary to general belief, retinal congestion and swelling of the disc are not distinctive signs of occlusion of this sinus, and, when present, indicate the involvement of the ophthalmic and retinal veins in the thrombotic process. Next to proptosis are the signs of involvement of the nerves which run in the walls of the sinus. Severe frontal headache or supra-orbital neuralgia, indicating disturbance of the first division of the fifth nerve, may be one of the earliest symptoms. The third, fourth and sixth nerves may all be affected, producing complete ophthalmoplegia externa, or only one, most commonly the third, may be paralysed. At first there may be myosis, but commonly mydriasis, ptosis and external strabismus occur. No doubt there must be phlebitis, as well as mere thrombosis, to produce total ophthalmoplegia, and if first one eye and then the other be thus affected, the inference of cavernous thrombosis is made almost certain, since such a sequence indicates the extension of the process from one side to the other. Of thrombosis of the remaining sinuses there are no distinctive signs.

Diagnosis.—It is thus apparent that, except in the case of the cavernous sinus, the diagnosis of sinus thrombosis is little more than conjectural. It must mainly depend, not upon direct signs, but on the existence of antecedent conditions favourable to thrombosis, conditions, that is, of debility and exhaustion, of impoverished blood and cardiac enfeeblement, in the marantic form; conditions of inflammation in the vicinity of the sinuses or their tributary veins, in the phlebitic. The differential diagnosis will have to be made from meningitis, tumour, hæmorrhage, or cerebral abscess, and as each of these lesions may coincide, either as antecedents, concomitants or results of sinus thrombosis, it is often impossible to determine the presence of the latter to the exclusion of the former.

The duration of the symptoms is no safe criterion, since the thrombosis may be very gradual and slow in producing complete occlusion. In a case of ear disease, undue fulness, and perhaps actual thrombosis of the jugular vein, will suggest that thrombosis of the lateral sinus is concerned in the production of any cerebral symptoms that may be present. In cases of marantic thrombosis of the longitudinal sinus, the only symptom may, as has been said, be severe persistent headache, until the occurrence of convulsions, paralysis, speedily followed by coma, point to the secondary production of meningeal hæmorrhage and red-softening.

Prognosis.—Although the majority of cases are fatal within one or two weeks of the appearance of cerebral symptoms, yet, in a few cases, there has been evidence of a slight amount of thrombosis being recovered from. This is more likely to be the case in the marantic than in the phlebitic form. In any case it is a rare event. Again, some cases of cavernous thrombosis, though ultimately fatal, have been of long duration.

Treatment.—There is little to be said on this head. The enforcement of absolute rest is imperative, and the symptom of pain needs to be dealt with. Ammonia and bark should be given in the marantic cases; bromides and even morphine may be required for the severe neuralgia and headache. If the symptoms be of long duration then iodide of potassium or sodium may be given, in the hope that the thrombus may be absorbed. The phlebitic cases are usually characterized by pyæmic symptoms, and therefore the treatment must be as for pyæmia. Prof. Horsley advocates the excision of the thrombosed lateral sinus in cases of ear disease as anticipatory of pyæmia, and has performed this operation in one case.

SIDNEY COUPLAND.

SIXTH NERVE, DISEASES OF.

—This nerve, which supplies the external rectus muscle of the eyeball, arises from its nucleus in the floor of the fourth ventricle, runs forwards in the substance of the pons and emerges near the middle line at the level of the junction of the pons with the medulla. Its nucleus is surrounded on three sides by the fibres of the facial nerve in their course from their nucleus to the surface of the medulla.

Paralysis is the most common affection of this nerve. The nucleus itself may

be involved in a tumour, especially of the substance of the pons. Outside the medulla and pons the nerve may be affected by syphilis, meningitis, tumours about the cavernous sinus, or in the orbit. One of the commonest causes is cold. The resulting paralysis is different according as the nerve or its nucleus is the seat of lesion.

In the case of the *nerve* there is internal strabismus of the eye of the same side, and the eyeball cannot be turned outwards. There is diplopia on looking towards the paralysed side, the false image being on the same side as the affected muscle, and the two images become more separated as the eyes are turned further out towards the affected side; in looking at an object above the horizontal line the false image is slanted so that its lower end is nearer to the true image than the upper, and with objects below the horizontal line the upper end is nearer to the true image than the lower. Secondary deviation is shown by the other eye moving outwards in fixing an object when the affected eye is covered up.

When the *nucleus* is affected there is, in addition to paralysis of the external rectus, inability of the internal rectus of the opposite eye to turn that eye inwards. As a consequence of this the axes of the eyes are kept parallel, and both are conjugately deviated to the opposite side, away from the side of lesion. The reason of this is that the nucleus of the sixth nerve sends fibres up in the pons to that part of the nucleus of the opposite third nerve which supplies the internal rectus; we thus have paralysis of the internal rectus without the nucleus of the third nerve being involved, owing to its receiving its nervous impulses for parallel movement from the sixth nucleus of the opposite side. As the sixth nucleus is in such close proximity to the facial nerve in the substance of the pons, it is frequently found that the whole of the face on the same side is paralysed, and gives the electrical reaction of degeneration, so that with a lesion of the *left* sixth nucleus there is conjugate deviation of both eyes to the *right*—i.e., paralysis of the left external and the right internal rectus, and sometimes complete paralysis of the *left* side of the face.

Diagnosis.—Paralysis from lesion of the nerve is usually diagnosed without much difficulty, especially if the secondary deviation of the sound eye and diplopia be noted. Lesions of the nucleus

are well shown by the above symptoms. Affections of the nerve just outside the medulla may also be associated with complete facial paralysis of the same side, but there would be no conjugate deviation of both eyes.

Tumours about the cavernous sinus or in the orbits would probably cause paralysis of the third nerve and optic atrophy of the same side.

Prognosis.—When the lesion is produced by tumours in the pons or at the base of the brain the prognosis is hopeless, but when in the orbit the growth can sometimes be reached. When due to cold or syphilis recovery usually occurs, especially in the former case.

Treatment.—When caused by cold, hot fomentations to the head, followed in the chronic condition by blisters to the temporal region of the affected side, and tonics internally are indicated. In cases where tumour is diagnosed, mercury and iodide of potassium in full doses should be given on the chance of its being syphilitic. In cases of paralysis due to cold, a very weak constant current of two or three cells, or more if the patient can bear it, may be applied to the closed eyelids.

C. E. BEEVOR.

SLEEP, DISORDERS OF.—It is necessary for the maintenance of health that sleep of a certain quality and quantity be regularly enjoyed. The exact amount required varies in different individuals and at various periods of life. Some people are naturally light sleepers and easily disturbed. It is evident that, *cæteris paribus*, such persons need more sleep than those whose slumber is profound, and in whom therefore the degree of rest is the more complete. The amount of sleep demanded varies very considerably, and probably largely depends upon the recuperative power of the individual and the extent of exhaustion, mental or physical, which the day's work entails. Sleep is generally more profound during the developmental period of life, and at that time the amount necessary is considerably in excess of what is subsequently required. Thus, a healthy new-born infant will sleep for twenty hours in the day, whilst during the prime of life some persons can maintain a condition of health upon five hours' sleep only, and others can occasionally go without sleep for thirty or forty hours with no apparent discomfort.

It is almost as requisite for the procuring of normal sleep that the body be

in a condition of health, as that sleep is necessary for the preservation of health. Disorders of sleep are therefore extremely common, and depend upon a multiplicity of causes. They also vary much in their nature, but may be roughly arranged, for purposes of classification, into three groups; in the first of which sleep is excessive, in the second defective in quantity, and in the third partial in character.

(1) **Excessive Sleep.**—An unusual amount of sleep may be a normal occurrence after prolonged labour, either physical or mental. It is also not uncommon at sea, but is most marked in cases of sea-sickness. Sleep, bordering on stupor, sometimes persists for days and even weeks after typhoid fever, and the same condition is frequently present in the course of many cerebral disorders.

Cases are occasionally met with in which there is a tendency to fall into a profound sleep, lasting, as a rule, a few minutes only, but sometimes persisting for an hour. Such attacks frequently occur in those affected by dreams, and may or may not accompany them. It is generally possible to awaken the patient, and, indeed, in most of its characters the sleep appears to be purely physiological. As such it must be carefully distinguished from a dreamy state, which sometimes occurs as a warning in cases of *petit mal*.

The condition called *trance* consists of a profound sleep lasting for hours or weeks. The subjects of it are usually liable to functional nerve disorders, and often come of a neurotic strain. In severe cases the organic functions of the body may be so lowered in their intensity that death is closely simulated, whilst in slighter attacks the patient may be perfectly sensible of his surroundings, though apparently quite unconscious. All grades exist between these two extremes. In some cases the condition seems closely allied to that which is induced by hypnotic suggestion.

The *sleeping sickness* is a disease which exclusively attacks the negro inhabitants of the West Coast of Africa. Its chief symptom is a gradually increasing somnolence, which ultimately ends in a profound sleep, from which the patient cannot be aroused. Emaciation occurs, and the termination is nearly always fatal in from three to six or twelve months from the commencement. The affection has been supposed to be in some way related to an enlargement of the cervical glands,

which sometimes takes place at the onset, but this is extremely doubtful.

(2) **Sleep Deficient in Quantity.**—An insufficient quantity of sleep may be obtained on account of restlessness, a condition arising from a great variety of causes, which need not be here detailed. It is essential for the treatment, however, that its causal relationships be recognized and appropriately remedied.

Much more important than restlessness, because more persisting and difficult to relieve, is inability to go to sleep—*insomnia*. This occurs in its most aggravated type in cases of delirium tremens, syphilitic insanity, acute and acute delirious mania, in which no sleep may be obtained for several days. Much more commonly the complaint is that it is impossible to get off to sleep for one or more hours after going to bed. In other cases again, a few hours normal sleep is succeeded by a prolonged state of wakefulness in the early morning. Insomnia is very often of purely functional origin, occurring in the nervous and impressionable, and depending upon mental overwork, worry, anxiety, &c. It is also frequently the result of various organic disorders, and may occur in the course of phthisis, pneumonia, Bright's disease, gastric or intestinal irritation, heart disease, senility and febrile conditions. Pain, too, is a common cause of sleeplessness.

Treatment.—As many conditions of ill-health contribute to the causation of insomnia, it is necessary that a very careful inquiry be made into the general state of health and habits of the patient. Some of the most difficult cases to cure are those which arise from worry, &c., because it is often found impossible to get rid altogether of the exciting cause. These patients should be recommended to indulge, when possible, in such exercise during the day as to create a feeling of moderate fatigue, and to read some light and interesting literature before retiring to bed. Among other homely devices, which sometimes succeed, may be mentioned bathing the feet in warm water and the taking of a cup of warm gruel, beef-tea, or dilute alcohol before going to bed. These means are not often successful of themselves, and then arises the question of hypnotics, in the administration of which great care and discretion are always necessary. Of these opium and chloral hydrate must still be regarded as the most reliable, but, until other measures have failed, should not be prescribed in cases of simple sleepless-

ness, for fear of developing the opium or chloral habit. Bromide of potassium, butyl chloral and cannabis indica, singly or combined, are frequently useful in the insomnia associated with neuralgia and headache. Paraldehyde is a safe and efficient hypnotic, but its nauseous taste is a great drawback to its general use. Sulphonal is a favourite remedy, but its insolubility, on account of which some hours may elapse before the desired effect is produced, is an objection in some cases. Both amylene hydrate (soluble in 1:8 of water) and chloralamide (soluble in about 1:3 of rectified spirits) promise to be of considerable value. Urethane is very unreliable, and the other recently introduced hypnotics, acetal, methylal, hypnone and chloral-urethane need only be mentioned. Sleeplessness resulting from pain or associated with heart disease is best treated with opium, which in lung disease is contra-indicated. In delirious states chloral hydrate, bromide of potassium, or hyoscine should be administered. In the treatment of the insomnia of various forms of insanity, paraldehyde, sulphonal, and amylene hydrate are at present the most popular remedies.

(3) **Sleep Partial in Character.**—During normal sleep the whole of the higher functions of the brain are in abeyance, and there is a persistence only of "vital" actions. It often happens, however, that some of the higher centres retain their activity although the functions of the highest are suspended—a condition, which may be termed "partial sleep." In this manner two great classes are formed, in the first of which there is a defect of consciousness and a correlative wildness of ideation—sleep with dreaming. In the second there is loss of consciousness and correlative elaborate motional actions—sleep with somnambulism.

In the course of *dreams* the most incongruous ideas are generally associated together into an ataxic whole, but in some people the flow of thought is to a certain extent sequential and orderly. Dreams are occasionally so vivid that they leave a lasting impression on the individual; at other times the images recalled during sleep are so faint that they pass unremembered. Children are peculiarly liable to dreams of a terrifying nature, possibly constructed upon the idle tales of servants and others. They awake screaming loudly, and such is the impression made upon them, that it takes a long time to make them disbelieve in

the actuality of all they have seen and heard. These children have generally a neuropathic hereditary or personal history. Happily, bromide of potassium in moderate doses is able to hold these so-called "night terrors" in check.

Somnambulist states are closely allied on the one hand to those unconscious and elaborate actions, which characterize post-epileptic automatism, and on the other, to one of the forms of unconsciousness produced by hypnotic suggestion. The somnambulist may retain his faculties of sight and equilibration to a really remarkable extent, but yet be altogether unconscious of his surroundings. And more, he may be able to exercise his intellectual faculties to an equal, and in some cases it is asserted even to a greater, degree than obtains during the state of wakefulness. Somnambulism must undoubtedly be regarded as one of the minor neuroses, and the subjects of it be looked upon as possessing a vulnerable nervous system, which may possibly break down in one way or another under any unwonted strain.

Treatment should be directed towards improving the general condition of the patient by placing him under favourable conditions of existence and by the administration of bromide of potassium at night.

SMALL-POX (Variola).—An acute infectious disease, characterized by a certain range of temperature and the development of a papular eruption, which becomes vesicular and ultimately papular.

Symptoms.—After an incubation period of from eight to fourteen days, during which, as a rule, there are no symptoms of ill-health, the disease commences suddenly with chills or actual rigors and high fever, with thirst, anorexia, a furred tongue, a full pulse, and nausea. Vomiting is an early, and common symptom, and usually there is constipation. Sweating is generally present from the first, and is often of diagnostic value. The temperature rises to a considerable height, 104° F. or 105° F. at the very outset; during the second and third day there are remissions, but it attains its maximum on the evening of the third day. Before the development of the characteristic eruption, however, certain *scarlatiniform eruptions* not infrequently appear, usually in the form of a more or less bright diffuse erythema in the lower part of the abdomen and legs, and also about the chest and trunk,

especially the axillæ and groins, and also at the bends of the elbows and in the popliteal spaces. A dusky erythema generally precedes a severe attack. About this time the papular eruption appears, and the severity of the disease will be directly proportional to the intensity and character of the eruption; the late appearance of the papules presages a mild attack; their premature appearance, on the other hand, is an evidence that the attack will be severe. The papules appear first on the face, scalp and neck, then on the chest and back, and subsequently on the extremities, about two days later than the face. They are at first solid, indurated and shotty, but gradually they become conical and may be surrounded by a red areola. The vesicular stage follows and umbilication takes place—*i.e.*, they have a central depression. The contents at this period become cloudy. At first the papules are separate and scattered (discrete); afterwards, when the eruption is more extensive and the vesicles are more closely aggregated, and when they run together, it is said to be confluent. Papules, or pocks as they are termed, may also appear on the mucous membrane of the mouth, throat and nose, and on the conjunctiva about the same time as on the skin.

The fever, constitutional disturbance and pains in the back remit when the rash comes out, and gradually disappear, so that at the end of the first stage—*i.e.*, about the eighth day, the patient may feel quite well. As a rule, the sweating is the only symptom which persists. About the ninth day the next stage—*i.e.*, the period of maturation, sets in, the pocks become larger and hemispherical in shape, and lose their umbilication, the surrounding skin becomes uniformly red or brawny and is swollen and painful; some of the pustules burst, their contents flow over the neighbouring skin and form large yellowish scabs, which, on the face, are very disfiguring. Salivation, a hoarse cough, nasal discharge and ophthalmia are all apt to be present, and sometimes there is purulent infiltration of the cornea. The fever now returns and is proportional in degree to the amount of suppuration. A disagreeable odour is often noticed about the patient.

In the confluent form all the above symptoms are much exaggerated, the face is covered with crusts, and the hands and feet are much swollen, whilst delirium or unconsciousness may be present. This

stage may last till the twentieth or twenty-second day. Confluent small-pox is particularly dangerous, death resulting from adynamia, gangrene or one of the complications about to be mentioned. In the less severe cases, about the eleventh or twelfth day, those pocks which have not ruptured begin to dry up, become brown in the centre, dry, sink in, and eventually form a round scab; the surrounding redness and swelling then subside, and the scabs come away in a few days, leaving violet-red elevations, which may, with time, completely disappear. In many of the pocks, however, the process will have gone deeper and will have involved the cutis vera; when such pocks fall off they leave a deep round scar with a punctated base, which at first is red, but ultimately becomes white and never disappears. In the confluent form the scars are larger and deeper, and the disfigurement is consequently much greater.

The most malignant form is the hæmorrhagic, here ecchymoses, petechiæ and vibices come out during the initial erythema, with hæmorrhages into the various mucous membranes and hæmaturia.

Sometimes death takes place before the typical eruption has had time to be developed, or before its characters can be recognized.

Modified Small-Pox (Varioloid).—Those who have been vaccinated, if they take the disease, usually have it in a modified form, “varioloid” as it is called. The initial fever is less, the pocks are less numerous and run their stages more rapidly; there is less surrounding redness, and the eruption hardly ever becomes confluent. There is no secondary fever, and as a rule the pocks fall off without leaving permanent scars; it is rarely fatal.

Complications.—Amongst the complications nephritis is one of the most common, especially in the confluent form; œdema of the larynx and purulent pneumonia also occur; both are very dangerous to life. During convalescence there is often a marked tendency to the development of boils. The initial pain in the back may be very severe, and is occasionally accompanied or followed by paraplegia.

Diagnosis.—In the early stages the chief points are the pain in the back and the sweating, signs which should always be regarded with suspicion in a pyrexial attack of unexplained origin. When the scarlatiniform rash is present the disease may be distinguished from that fever

by the absence of the throat symptoms and of the characteristic appearance of the tongue, and by the absence of a fall of the temperature after the appearance of the rash. The eruption of measles has some features in common with small-pox, but the spots are more minute; they are aggregated into clusters, they come out more rapidly over the whole body, and they are preceded and accompanied by catarrhal symptoms. The hæmorrhagic form sometimes presents difficulties in diagnosis which are almost insuperable; pain in the back is the symptom upon which the greatest stress should be laid in such cases.

Pathology.—The changes which take place in the skin leading to the formation of the papules are as follows: At first there is hyperæmia of the papillary layer of the corium, with thickening of the rete; the papillæ increase in size, forming the solid papules; between the meshes of the reticulum serous fluid is exuded, forming the vesicle. The umbilication is due to the lesion occurring at the origin of a hair follicle or duct of one of the sudoriparous glands. The epithelial septa gradually give way, and cause the pock to become hemispherical and to lose its umbilication, and its contents to become cloudy.

Ætiology.—The disease is both infectious and contagious, but the materies morbi has not as yet been isolated. It may be conveyed by the breath before the eruption has appeared, or by inoculation of the contents of the pock. No age is exempt, and during an epidemic all who are unprotected by a previous attack or by vaccination, as a rule take it; second attacks, though decidedly rare, are not unknown.

Treatment.—Vaccination or re-vaccination, if performed at any time before the symptoms have actually appeared, would probably be in time to modify the course of the disease. Careful dieting and nursing are all important; but during convalescence the diet should be especially nutritious. When once the disease has developed it will run its course without being materially influenced by treatment. Stimulants should be given or withheld on general principles. Various measures have been proposed to prevent the pitting, none of them are completely satisfactory; covering the face with a mercuric plaister, or puncturing each pock separately and inserting a little nitrate of silver, are methods recommended by persons of great experience. To allay the irritation, which, from the

swollen condition of the skin is always very great, cold compresses or a solution of corrosive sublimate may be used, or the face may be anointed with carbolised vaseline. JOHN ABERCROMBIE.

SNEEZING, PAROXYSMAL. —

A symptom most commonly met with in the subjects of asthma and hay fever. The attack may be excited by any direct irritant, a bright light, cold, dust, the pollen of certain grasses, or the presence of certain articles of food in the stomach. Gout and hysteria have also been assigned as causes. The attack is usually accompanied by intense itching of the interior of the nose, and sometimes of the conjunctivæ and throat also.

The most effective treatment is the insertion high up the nose of a tabloid of cocaine, or the interior of the nose may be painted with a 5 per cent. solution of cocaine. The inhalation of iodised vapour (tr. iodi π xx-xxx to a pint of boiling water) has also been found useful. Some cases are relieved by sniffing strong "smelling salts." (See also HAY FEVER.)

SORDES are the crusts which form about the lips and teeth in the course of a serious illness, which is most often of a febrile character. They are composed of debris of food and epithelium, schizomycetes and micrococci being present in great numbers. Sordes may be yellow, brown or black in colour, and vary in thickness according to the degree of prostration, and the length of time they have been allowed to collect. They only form on those parts of the lips, teeth and gums that are habitually exposed to the air. They are rather firmly adherent, and should be removed by careful sponging.

SOMNAMBULISM (Sleep-walking). An unconscious state of automatic movement, sensation and intellectual activity of various extent, and sometimes anomalous character, which is almost always continuous with normal sleep, occurring in it rarely and as an interlude.

In the simpler instances of such an affection, there may be no definite symptoms of bad health; the sleep-walker may for an hour or so during normal sleep get up and dress himself without losing his unconsciousness, and employ himself on something he has set his mind upon, or on his daily occupation. For example, a housemaid may begin

to dust the furniture; a chemist to make up the prescriptions, and having done so, may return to bed again and to natural slumber, waking subsequently without any recollection of anything that has happened, and without any power of recalling it, even when any evidence of the work done causes surprise and calls attention. Such conditions, though not very rare, have not as yet been sufficiently widely and accurately observed to make us thoroughly familiar with all their physical details and psychological characteristics. They are not common in childhood and youth, not markedly more common in girls than boys. They generally go along with a neurotic temperament or tendency to such general disturbance of nervous equilibrium as epilepsy, hysteria, chorea or megrim; but there are some cases which seem to accompany excellent health, and others only a passing emotional excitement, such as chagrin, anger, or surprise. To a slight extent the diathesis is hereditary; there are also some instances of the habit spreading from one person to another by the hysterical tendency to imitation (neuromimesis). It is very rare in idiots, and not more frequent in the insane than in the sane. In a case well observed by Mesnet, it came on about six months after a severe bullet wound in the left parietal bone, and the resultant state resembled very closely what Charcot has called the somnambulist stage of hypnotism. The man passed into a state in which he would write and talk reasonably, with open eyes and full apparent command of his senses, but without consciousness at the time or subsequent memory. There is hyperesthesia of touch and hearing in a few cases, and nyctalopia, and in a great majority good muscular sense; but frequently hearing and sensation are nearly or quite gone, and now and then there is loss of balance.

The term somnambulism has been used of late years, especially in France, to cover a wider range of mental abnormalities, among which are a state of profound lethargy which may simulate death (*cf.* TRANCE), and a condition of quiet secondary personality, which has in a few rare cases for long replaced the normal character. The memory in consecutive somnambulist attacks is generally continuous from one to the other, and entirely separate from that of the ordinary life, and it is remarkable that it has been revived by artificial hypnotism. M. Dufay observed a case

in which a lady's maid in a somnambulist state put away her mistress's jewels for safety, was accused of stealing them, could recollect nothing, and was unable to disprove the charge, and kept in prison until memory of the somnambulist act was revived by hypnotism; it was explained satisfactorily, and she was set free.

Of the *pathology* of this condition nothing is definitely known; the symptoms suggest a close analogy to the sometimes active state of post-epileptic automatism.

Treatment.—It is judicious to forbid and even punish the attack, although there is honestly no recollection of its occurrence, for as a rule the organic memory takes effect.

A. T. MYERS.

SPASM.—An abnormal contraction of striped or unstriped muscle fibre. The term *cramp* is generally used to designate spasm accompanied by pain.

1. *Spasm of involuntary muscle* is of common occurrence, as unstriped muscular tissue is present in the coats of most hollow organs. Excessive stimulation in any of these induces an increase of afferent impulses and a corresponding degree of muscular contraction, which persists as long as the irritation is continued. In this way reflex spasm arises—*i.e.*, a muscular contraction, abnormal in degree and duration, and depending for its production upon the presence of some local irritation. It would be needless to enumerate all the examples of this action, but as illustrations may be mentioned renal and biliary colic, œsophagismus, rectal and vesical tenesmus. The vaso-motor system is brought into connection with certain psychical states, and it happens, therefore, that although spasm of the arteries may result from reflex action, it may also occur as an expression of emotion—*e.g.*, fear and rage. Bronchial spasm is in some cases undoubtedly due to peripheral irritation, and in others it is as clearly of central origin.

2. *Spasm of voluntary or striped muscle* manifests itself in various ways. The contractions may be continuous and *tonic* in character, or they may be subject to regular relaxations, and are then termed *clonic*. In some cases more or less extensive movements are produced, which may be rhythmical or disorderly, in others tremor only results. Tonic spasm may occur as a functional affection, from organic cerebral, or spinal disease, and

probably also from direct irritation of the nerve trunks in cases of spinal meningitis. For a consideration of the contractures which occur from these causes, the article on RIGIDITY may be consulted.

In regard to the origin of the spasm in cerebral disease many opinions are held. Hitzig believes that the late rigidity of hemiplegia represents the sum of the associated movements, which are no doubt often increased in that condition, and seem in some cases to increase the spasm. The persistence of the rigidity during complete rest, as in sleep, tells strongly against this view. Others look for the cause in the removal of cerebral influence, but this does not sufficiently explain the occurrence of spasm some weeks after the onset of the lesion, unless indeed it be allowed that the action of the anterior cells of the cord gathers in intensity and undergoes a sort of dynamical hypertrophy, after the restraining influence of the brain is taken away. Hughlings Jackson regards the cerebellum as possessing motor functions, supplementing those of the cerebrum, and being in a way antagonistic to them. He considers late rigidity to be due to an unantagonized cerebellar influence. Charcot and others consider that the initial increase of reflexes, which occurs a week or two after a hemiplegic seizure, is possibly due to moderating cerebral influence, but that the rigid spasm of contracture is caused by a sclerosis of the lateral columns of the cord, irritating, and producing an over-action of, the anterior motor cells.

Clonic spasms are typically seen in an epileptic fit, after the stage of rigidity is over. They probably depend upon exhaustion of, the discharging cortical motor centres, which are no longer able to keep up a tonic contraction. Irregular or mobile spasm sometimes occurs in cases of hemiplegia, in which some power is regained, but it may also exist as a primary affection. The movements may be constant and may even persist during sleep, but they are usually most marked during voluntary effort. They are much more frequent in the arm than the leg, and are often associated with hemianæsthesia. Little is known with regard to the nature of these spasms. They are more common in children, and after embolism rather than hæmorrhage. In adults the lesion is always in the optic thalamus or its neighbourhood, and very often in the posterior part of the internal capsule. Similar choreiform spasm has been

noticed in cases of tumour near the optic thalamus and of growths involving the parietal lobe. The characteristic spasm upon voluntary movement in cases of disseminated sclerosis is probably due to irregular wasting of the white substance of Schwann, on account of which an impulse meets with unequal resistance in different parts of its course, and a disorderly movement results. The same symptom is rarely met with after hemiplegia, and in some cases of tumour of the pons or crus.

Spasm in Spinal Disease (Pathology of).

—Spasm is a frequent result of those lesions of the cord in which the lateral columns are affected—*e.g.*, spastic spinal paralysis, disseminated sclerosis, myelitis, &c. It has not yet been definitely settled whether the rigidity in these cases is due to loss of cerebral control, to irritation of the anterior motor cells, or to the combined influence of the two.

WM. GAY.

SPHYGMOGRAPH.—The sphygmograph is an instrument by which what is known as the pulse of an artery may be graphically recorded. It consists essentially of a lever, the short arm of which presses on the artery, while the long arm magnifies the movements transmitted to the short arm, and records them upon a moving surface. A simple sphygmograph may be made by crossing one leg in the flexed position over the opposite knee. The popliteal artery of the crossed leg is then pressed between the two knees and its movements are transmitted to the leg of the same side, being amplified by the length of the leg. If then by some means the foot of the superimposed leg be made to write on a revolving cylinder, the pulse will be recorded graphically.

For practical purposes three varieties of instrument are employed:—Marey's original sphygmograph, its modification by Mahomed, and the simpler instrument of Pond and Dudgeon. The latter two are provided with an arrangement by which graduated pressure can be applied to the artery, and by means of a dial the pressure can be read off in ounces. This, however, is a source of fallacy, for so much depends upon the way in which the instrument is applied, its mode of contact with the artery, and the substance against which the vessel is pressed, that little reliance can be placed on comparative measurements of the pressure exerted at different times. Nevertheless, when the instrument is properly applied,

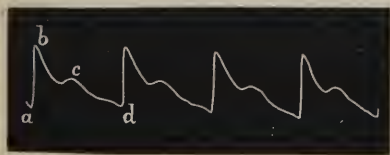
by an experienced observer, and the artery duly pressed against a bone in a direction at right angles to its length, the indications of the dial afford some idea of the relative pressure under which different tracings are taken. It must not be supposed, however, that what are termed, on the dial, "ounces," represent, in fact, ounces of pressure. They represent simply degrees of pressure, and the degrees are not by any means equal.

Of the three instruments mentioned, that of Pond and Dudgeon is the most convenient of application, but is also the most erroneous in its records. Of the other two, that will be preferred, to which an observer has accustomed himself, and, possibly for this reason only, the writer prefers Mahomed's modification of Marey's instrument.

A tracing being required of the radial pulse and the Mahomed sphygmograph being used, the hand is laid on a wooden rest in an easy position of supination, with the wrist somewhat extended. The site of the artery is then ascertained, and an ink mark made over the artery where it lies upon the styloid process of the radius. The instrument is then placed on the fore-arm, with the button immediately over the ink mark, and is secured to the rest by means of straps. Pressure is applied by the screw and excentric, with which the instrument is provided, until the recording needle shows the most ample movement, when the degrees of pressure (so-called "ounces") are noted. The needle being then brought into contact with a blackened plate which travels by clockwork, a tracing results which records the movements of the artery.

Normal Pulse.—Fig. 1 represents the tracing obtained from a normal

FIG. 1.



pulse. It consists of:—(1) An ascent more or less vertical (*a* to *b*), (2) a summit (*b*), and (3) a descent (*b* to *d*) which is broken by a second elevation (*c*) the dicrotic wave. The horizontal line from which the up-stroke starts is called the base line. The height of the ascent represents the degree of change of shape of the artery, which, as stated previously,

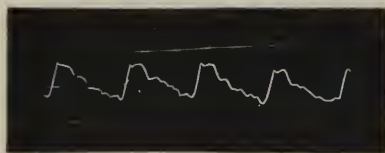
is really what we feel as the normal pulse. Thus the height of the ascent is a measure of the "size" of the pulse. The sudden or gradual manner in which the pulse impresses itself upon the finger is represented in the tracing by the vertical or sloping direction of the ascent. The summit is often broken by a small wave, which is usually known as the "percussion wave." Its origin has been somewhat questioned; probably it is not related to any change in the artery, but is due simply to the needle being jerked by the artery to a greater height than is warranted by the change in the shape of the artery. The needle therefore soon descends slightly to the level corresponding with the true movement of the button in contact with the artery. The total summit is known as the tidal wave, its horizontal extent from the beginning of the summit to the beginning of the descent, represents the "length" of the pulse, and is a measure of the length of contraction of the left ventricle, or at least of the time during which the contraction of the ventricle increases the tension in the arteries. The portion of the tracing which extends from the end of the tidal wave to the base line is the descent. Its sudden or gradual progression to the base indicates the manner in which the increase of tension, due to the ventricular systole, is lost in the arteries. The notch in the descent, formed by the dicrotic wave, is known as the dicrotic notch. Its height above the base line indicates inversely the time which elapses after the systole of the ventricle is completed before the elastic recoil of the arteries increases the tension in the radial artery. It is one measure, therefore, of the degree of arterial tension and in time it corresponds with the closure of the aortic valves. The height of the dicrotic wave is a similar measure of tension in the arteries, being the more marked when the tension is low. Generally speaking, the higher the dicrotic notch above the base-line the less marked is the dicrotic wave, and *vice versa*. The base line is often not perfectly horizontal, but shows a curve of its own, comprising in its extent four, five, or six tracings of individual pulse beats. This is the respiratory curve, and is due to the alterations of arterial pressure produced by respiration. It is not uncommon to meet with numerous small waves in addition to the dicrotic wave; these result from vibrations of the needle not communicated to it by the artery. They are to be avoided to a great extent by a proper

application of the instrument, but some are inherent in the sphygmograph; they are most numerous with the Pond-Dudgeon instrument, least numerous with that of Marey.

Irregular Pulse.—The various forms of irregular pulse which are described in the article on PULSE, will be indicated in the sphygmographic tracing, to the same degree in which they are detected by the finger. These do not need further mention here. In certain pathological states, however, the tracings are characteristic, and are a useful help to the mere digital examination.

High Arterial Tension.—The tracing of high arterial tension shows a somewhat slanting ascent of no great height, a square or rounded summit, a lengthened tidal wave, a gradual descent, a high dicrotic notch, and slightly marked dicrotic wave (Fig. 2). The explanation of

FIG. 2.

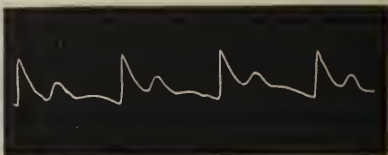


these peculiarities which appears most probable is the following:—The arteries are contracted, and therefore do not admit of a pulse of great "size," consequently the lever of the sphygmograph is not greatly raised, and the ascent is low. The ventricular contraction is somewhat slow in increasing the already high tension, and thus there is produced the gradual pulse and the sloping ascent of the tracing. The left ventricle must maintain a prolonged contraction to drive the blood onwards against the increased resistance, and thus the tidal wave is long and the summit rounded. The recoil of the arteries, when their tension is great, must occur very shortly after the ventricle has ceased acting, and, consequently, the dicrotic notch appears early in the descent of the needle and high above the base line. The tense arteries do not allow themselves to be greatly distended by the blood forced into them by the ventricles, and as a result of this their elastic recoil, which produces the dicrotic wave, is but slight.

Low Arterial Tension.—In low arterial tension we have an ascent which is extensive, and is perpendicular or even sloped backwards (Fig. 3). The ascent is either high or low, according as the left

ventricle is acting forcibly or feebly, either of which conditions may exist.

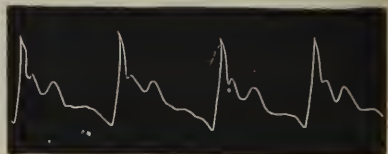
FIG. 3.



The summit is sharp, the tidal wave short, the descent sudden, the dicrotic notch low, and the dicrotic wave well marked. Here the relaxed arteries allow themselves to be suddenly and greatly expanded by the blood forced into them from the ventricle, and thus cause the extensive and perpendicular up-stroke; no prolonged contraction of the ventricle is necessary, hence the sharp summit and short tidal wave. The relaxed arteries lose the temporary tension imparted to them by the ventricular systole as easily as they gain it, and consequently the descent is abrupt, while their laxity favours an extensive but delayed recoil, and causes the well-marked dicrotism and low dicrotic notch.

Virtual Tension.—In "virtual" tension (*see* PULSE) we find a tracing showing a combination of the characters of high and low tension (Fig. 4). The up-

FIG. 4.



stroke is extensive and high, the summit sharp, the tidal wave short, the descent somewhat sudden, the dicrotic wave well marked; but the dicrotic notch is high above the base line. As already stated, this form of pulse indicates peripheral resistance with a failing left ventricle and dilated arteries.

Aortic Regurgitation.—In aortic regurgitation the tracing usually shows a high and perpendicular ascent, a sharp summit, short tidal wave, and an abrupt descent, in which there is scarcely any indication of a dicrotic wave (Fig. 5). The latter two features are characteristic. As has already been stated, the pulse in aortic regurgitation is quite a different phenomenon to the normal pulse. Here the

radial artery is really distended by blood with each ventricular systole, becoming

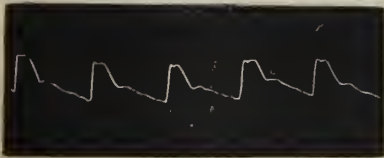
FIG. 5.



empty during each diastole. The tension is suddenly increased, to be just as suddenly decreased. This explains why the descent of the tracing is so abrupt. The recoil of the arteries after the ventricular systole can only influence the tension in the general arterial system when the aortic valves close perfectly, and offer a sufficient *point d'appui*. When the valves are incompetent, the recoil of the arteries will be greatly spent in forcing blood back into the left ventricle, and consequently no dicrotic wave will be seen.

Aortic Stenosis.—In aortic stenosis the systole of the left ventricle can only gradually influence the general arterial tension, and its force will be exerted for a considerable time (Fig. 6). As the result

FIG. 6.



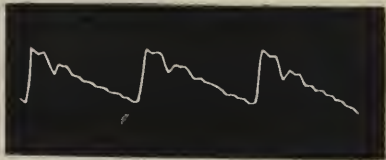
of this we find a tracing showing a gradual and low ascent, a rounded apex, and a long tidal wave. The descent is gradual, because the arteries "contract down upon the diminished blood-stream" (as Dr. Broadbent has put it), and as a consequence the increase of tension due to the ventricular systole is only gradually lost. There is no great distension of the aorta by the systole, hence but a small recoil, and therefore little or no dicrotic wave appears in the tracing. The tracing very much resembles that which is found in aneurysm, to be described later, but it is to be obtained usually with the application of a much lower pressure than suffices for the aneurysmal tracing. Such is the usual tracing of aortic stenosis, but occasionally another and quite different one is obtained. Here we find a trace with three separate summits, but

at different heights above the base line, the first being generally the highest. The first is probably a percussion wave, the second a tidal wave; the conditions of dicrotism are not present, consequently the third summit cannot be that of a dicrotic wave, but Dr. Broadbent explains it as an instance of *pulsus bisferiens*, due to a reinforcement of the ventricular systole near its close by a further muscular spasm.

Where aortic stenosis and regurgitation are combined, as is commonly the case, the characters of the tracings are to a certain extent also combined. It will mainly be noticed that the sudden ascent and descent characteristic of aortic regurgitation are lost.

Atheroma of the Arteries.—In atheroma of the arteries, affecting amongst others the arch of the aorta, a tracing is obtained which shows a well-marked, but not high percussion wave, a prolonged tidal wave, a low dicrotic notch, and an ill-marked dicrotic wave (Fig. 7). The

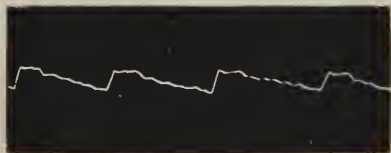
FIG. 7.



rigidity of the arteries, possibly, accounts for the appearance of the first. The necessarily hypertrophied condition and prolonged action of the left ventricle causes the prolonged tidal wave, while slight expansion and consequently small recoil of the arteries produce the condition of the dicrotic wave.

Aneurysm.—The typical aneurysmal pulse gives a tracing characterized by a low sloping ascent, rounded summit, prolonged tidal wave, and a gradual descent, in which the secondary waves are lost (Fig. 8). This tracing resembles that of

FIG. 8.



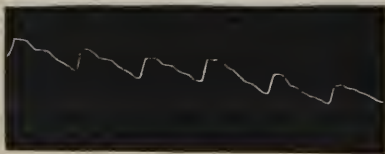
aortic stenosis, but is obtained in its best form with the application of a much higher pressure than is required for the

tracing in the latter disease. In its typical condition the characters of the tracing are due to the interposition of the elastic reservoir formed by the aneurysm, between the ventricle and the artery examined. The impact of the ventricle, as well as the shock of recoil of the arteries, is absorbed by the aneurysmal reservoir, to be distributed more gradually to the arteries. The form of the tracing is thus easily explained. But the aneurysm acting in this way maintains a constant supply of blood to the arteries, thus accounting for the great amount of pressure usually necessary to bring out the tracing. Yet the conditions of the circulation in aneurysm are not always those just described. The aneurysm may press on the artery examined, or on a trunk from which it springs; and again it may narrow the mouth of an artery which arises from the sac. In these conditions a similar tracing is obtained, but, the writer thinks, by the application of a lower pressure than when the typical aneurysmal conditions are present. In fact, the conditions, and therefore the tracing, resemble those of aortic stenosis.

It is in respect to the diagnosis of aneurysm that the sphygmograph is of most clinical value. Its indications are shown, when the unaided finger, no matter how highly educated, is sometimes at fault, whereas in other affections the findings of the finger are only recorded and supported by the tracing.

Mitral Stenosis.—Here the sphygmographic tracing resembles that of high arterial tension (Fig. 9). The ascent is

FIG. 9.



gradual and low, lower indeed than is ordinarily the case in simple high tension; the summit is rounded, the tidal wave moderately long, the descent gradual, the dicotitic wave slight, and the dicotitic notch fairly high above the base line. The conditions of the circulation are (1) that the left ventricle is imperfectly filled, and consequently its action produces only a slight rise of the sphygmographic lever; (2) the arteries contract down upon the diminished supply of blood, and so only gradually receive the

impact of the ventricle, causing the upstroke of the tracing to be sloping, and the summit rounded. The contracted state of the arteries also hinders their recoil, and tends to eliminate the dicotitic wave. It is to be specially remarked that the separate pulse tracings are uniform in character and equal in size.

Mitral Regurgitation.—The opposite is the case in this affection, for the tracings are pre-eminently irregular in size and character (Fig. 10). Their pre-

FIG. 10.



vailing type is that of low tension, a straight ascent, sharp summit, short tidal wave, sudden descent, moderate dicotitic wave, with low dicotitic notch. But the extreme irregularity in the action of the left ventricle, which is characteristic of the disease, causes all these appearances to vary greatly with the individual pulse beats.

ROBERT MAGUIRE.

SPINAL ACCESSORY NERVE

(the eleventh pair of cranial nerves).—This consists of two parts, the smaller or internal part (accessory), which joins the pneumogastric nerve, and a larger or external part (spinal), which is supplied to the sterno-mastoid and trapezius muscles. The accessory part arises from the continuation downwards in the medulla of the vagus nucleus, that part of it which lies behind the closed central canal of the cord and also just outside the point of the calamus scriptorius. The fibres from this part course through the medulla, taking the same direction as the vagus nerve above them, and they must be looked upon as a root of that nerve, which they finally join (*see PNEUMOGASTRIC NERVE*). The spinal part arises from the whole extent of the cervical portion of the spinal cord as far down as the fifth or sixth cervical roots, by a series of roots along the lateral column, from the intermedio-lateral tract and adjacent part of the anterior cornu below and the formatio reticularis and base of the posterior cornu above. The nerve ascends the spinal canal, passes through the foramen magnum, gives some branches to the accessory part, and

passes out of the skull by the foramen jugulare; it pierces the sterno-mastoid muscle, supplying it, and ends in the trapezius muscle, where it forms a plexus with branches from the cervical nerves. The nerve is liable to be affected at its nucleus as in acute bulbar paralysis, or in the more chronic form, but in these cases the accessory part is much more involved than the spinal, for whereas paralysis of the soft palate, pharynx and larynx are common symptoms of chronic bulbar disease (*see* PNEUMOGASTRIC NERVE), paralysis and wasting of the sterno-mastoid and trapezius are rare; in fact, the upper fibres of the latter are the last to be affected.

Both parts of the nerve are involved in meningitis, simple or syphilitic, tumours outside the medulla, and fractures or dislocation of the cervical vertebrae; in such cases there is paralysis of one half of the soft palate, one vocal cord and one sterno-mastoid and trapezius, all on the same side (Hughlings Jackson). The spinal part alone is apt to be implicated in its long course from the cord to the muscles, by growths or meningitis in the spinal canal, or by enlarged glands, tumours or abscess in the posterior triangle of the neck, or simply by cold. Here the sterno-mastoid and trapezius of the same side will be paralysed, but the latter not completely, as its middle and lower parts receive fibres from the cervical plexus.

The symptoms of paralysis of the accessory part are given with the description of the pneumogastric nerve. When the spinal part is paralysed the patient cannot rotate the head to the opposite side, and is not able to use the upper part of the trapezius in shrugging the shoulders, while complete fixation of the scapula cannot be affected, and muscles like the deltoid work at a disadvantage. The paralysed muscles waste and give the reaction of degeneration to electrical currents.

The *prognosis and treatment* depend very much on the cause; when the paralysis is due to cold the prognosis is favourable, but very unfavourable when caused by growths, unless they can be removed. In the early stage of the former condition a blister applied over the course of the nerve, and the use of the constant current to the muscles would be the suitable treatment.

Besides paralysis, the muscles supplied by the spinal accessory nerve are liable to be affected by spasm, giving rise to

what is known as torticollis or wry-neck (*q.v.*).
C. E. BEEVOR.

SPINAL CORD, ANÆMIA OF. —

Symptoms.—Little is positively known about the symptoms induced by diminished vascular supply to the spinal cord. In anæmia, simple and pernicious, weakness of the limbs is frequently present, and may be due in part to altered nutrition of the cord. It has been alleged that structural changes may develop from persistent anæmia, and the writer has seen one case, in which degeneration occurred in the white matter of the cord, in a patient suffering from pernicious anæmia. Paraplegia has been described as occurring after profuse hæmorrhage from the uterus, stomach and other parts; from obstruction of the spinal arteries, and from obstruction of the abdominal aorta by compression, thrombosis or embolism. Vaso-motor ischæmia of the cord from peripheral irritation has been invoked to explain various transient and subjective sensations in the extremities; but such an assumption is quite hypothetical.

Treatment.—General anæmia will require the usual remedies, of which iron and arsenic are the chief. When the symptoms depend on hæmorrhage, attention should be directed to the special organ at fault. At the same time the recumbent position, with the head and legs raised should be enforced. The use of the constant current to the vertebral column has been suggested, as well as the application of heat by means of sand bags or Chapman's spinal bags.

W. B. HADDEN.

SPINAL CORD, ANATOMY AND PHYSIOLOGY OF. —

The spinal cord extends from the foramen magnum to the level of the body of the second lumbar vertebra. The pia mater, which closely invests the surface sends a process into the anterior median fissure, is continuous with the fibrous strands penetrating the substance of the cord, and furnishes a covering to the nerve-roots. Superficial to the pia mater, and loosely united to it by fine strands of connective tissue, is the thin arachnoid membrane. The interval between the two is the sub-arachnoid space which is in direct continuity with the sub-arachnoid space of the brain, and through the foramen of Majendie with the ventricles. The ligamentum denticulatum passes on each side between the spinal arachnoid and pia mater, midway be-

tween the anterior and posterior roots, thus dividing the spinal sub-arachnoid space into an anterior and posterior part. The external membrane of the cord, or dura mater, is separated from the bony canal by venous plexures and loose areolar tissue.

The spinal cord presents two enlargements, the cervical, extending from the level of the third cervical vertebra to the second dorsal; the lumbar beginning at the tenth dorsal vertebra and reaching to the second lumbar. Between the second and tenth dorsal vertebra the cord is small and of uniform size. In the middle line of the cord in front is the anterior median fissure which reaches as far as the anterior commissure. The posterior median fissure, really composed of connective tissue, extends to the posterior commissure and separates one posterior column from another. On each side of the posterior median fissure is the rather ill-defined posterior intermediate septum, which marks off the postero-median column (column of Goll) from the postero-external column (column of Burdach or posterior root-zone). The white matter between the posterior cornu and the anterior median fissure is the antero-lateral column, which is sub-divided into the anterior and lateral columns, the point of limitation being the most external of the anterior nerve-roots. The white matter is composed of nerve-fibres of different sizes, surrounded by and embedded in the nerve-cement or neuroglia, in which are scattered small nucleated bodies called the cells of Deiters.

Tracts or Systems of the Cord.—It has been shown by means of pathological investigation, by experimental observations on animals, and by researches in embryology, that the white matter of each half of the cord, which to the naked eye is of uniform appearance, is made up of definite tracts or systems having distinctive functions. Moreover, it has been found that these tracts of fibres degenerate according to a law, first propounded by Waller; efferent fibres, such as those of the pyramidal tracts, when destroyed at any part in their course, undergo *descending* degeneration; afferent fibres, such as those of the columns of Goll, undergo *ascending* degeneration.

On a transverse section of the cord (as shown in the diagram) the various areas alluded to are exhibited.

The *crossed pyramidal tract* occupies the posterior part of the lateral column, outside the posterior cornu, with which

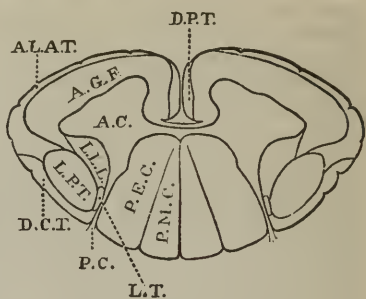


Diagram of Section of Spinal Cord at level of Fifth Cervical Nerve Root.

- D.P.T. Direct Pyramidal Tract.
- L.P.T. Crossed (or lateral) Pyramidal Tract.
- A.L.A.T. Antero-lateral Ascending Tract.
- D.C.T. Direct Cerebellar Tract.
- L.T. Lissauer's Tract.
- L.L.L. Lateral Limiting Layer.
- A.G.F. Anterior Ground Fibres.
- A.C. Anterior Cornu.
- P.C. Posterior Cornu.
- P.E.C. Postero-external Column.
- P.M.C. Postero-median Column.

it is in contact posteriorly, though anteriorly it is separated from the grey matter by the *lateral limiting layer*. This latter is made up of short fibres connecting the grey matter at different levels. In the lower dorsal and lumbar regions the pyramidal tract reaches to the surface; but in the greater part of the cervical and dorsal regions it is separated from the periphery by the *direct cerebellar tract*.

The *direct pyramidal tracts*, which are subject to considerable variations in size and form, are situated on each side of the anterior median fissure. Often they cannot be traced beyond the middle or lower dorsal region.

The *anterior ground fibres* occupy the rest of the anterior columns. They are probably commissural, connecting the anterior cornua at different levels and also those of the opposite side.

The direct and lateral pyramidal tracts transmit voluntary motor impulses from the brain. Tracing this motor tract from above, it may be stated briefly that the fibres pass from the central convolutions, with the multipolar cells of which they are supposed to be in relation, to the internal capsule, occupying the anterior two-thirds of its posterior segment. In the peduncle, the fibres form a compact bundle, lying in the middle third of the "foot" or lower layer of the crus. In the pons the fibres

are split up into bundles, so that they are not so readily distinguished as elsewhere. The tract again forms a compact area in the medulla oblongata, constituting the anterior pyramids. At the lower part of the bulb the decussation takes place, giving rise to the direct and crossed pyramidal tracts just described. There is little doubt that many of the fibres again decussate lower down in the cord, and it is very probable that an intercrossing also occurs to a varying extent at other levels above the medulla. It has already been stated that there is a strong presumption that each pyramidal tract fibre is in relation to a multipolar cell in the cerebral cortex. It is equally probable that the termination of each fibre is connected with a spinal multipolar cell. The lateral pyramidal tract, though mainly composed of large fibres transmitting motor impulses, contains in addition many nerve-tubes of small size, some of which belong to the same system as the direct cerebellar tract, and degenerate in an upward direction.

The *direct cerebellar tract* is situated at the periphery of the posterior half of the lateral column, just external to the crossed pyramidal tract. It begins in the upper lumbar or lower dorsal region, increases in size in passing upwards, and finally enters the cerebellum by the restiform body. This tract is supposed to be connected with the cells in Clarke's posterior vesicular column, but its exact function is still unknown.

The so-called *antero-lateral ascending tract* is situated in the anterior mixed region of the lateral column, lying in front of the direct cerebellar tract, with which it is in some places continuous. The other fibres of the anterior mixed region are partly connected with the anterior roots and partly commissural. The antero-lateral tract is roughly wedge-shaped, the base reaching to the periphery of the cord and sometimes extending nearly as far forwards as the anterior median fissure. This tract probably has its origin in the lumbar region, but its termination above is uncertain. The fibres appear to be in relation with the posterior nerve-roots, possibly through the posterior vesicular columns. The writer is of opinion that the fibres enter the cerebellum by the restiform body, but some observers believe that the tract is connected with the nucleus lateralis in the medulla.

The *postero-median columns* or columns of Goll, which are small in the lumbar region and increase in bulk in passing

upwards, enter the medulla as the fasciculi graciles and reach as high as the clavate nuclei. The fibres which compose these tracts are derived mainly from the posterior nerve-roots. The degeneration is ascending.

The *postero-external columns* or columns of Burdach are composed mainly of short vertical fibres, probably commissural, partly of horizontal and oblique fibres from the posterior roots, and partly of horizontal fibres passing between the posterior cornu and the postero-median column. The degeneration in this tract is of short vertical extent in an ascending degeneration.

Lissauer's tract is composed of fine nerve-fibres lying in front of and behind the entrance of the posterior roots. These fibres, which proceed from posterior roots at a lower level, are supposed to be in relation with the posterior vesicular column.

The *grey matter* is composed of the anterior and posterior cornua, an intervening lateral part, and the central grey matter, the latter being pierced by the central canal. The grey matter is subject to considerable variations in size and form, but into these details it is not now necessary to enter. Both anterior and posterior cornua are composed of a spongy network of fine fibres partly proceeding from the adjoining white matter, partly from the nerve-cells; in addition there is the neuroglia, and scattered through the network are cells of various sizes. The cells in the anterior cornu are mostly of large size (ganglionic or multipolar), are connected with the fibres of the anterior roots, and through them and the motor nerves control the nutrition of the voluntary muscles. These cells, when seen in a cross section of the cord, are arranged in groups, which are termed, from their position, *internal*, *anterior*, *antero-lateral*, *postero-lateral* and *central*. In the lower cervical and upper dorsal regions there is a group of cells occupying the external part of the root of the posterior cornu; this is Clarke's *intermedio-lateral tract*. In the posterior horns the cells are small, spindle-shaped and diffusely scattered.

At the inner part of the base of the posterior cornu, chiefly in the upper lumbar and lower dorsal regions, is Clarke's *posterior vesicular column*, in which are placed fusiform cells, some furnished with axis-cylinder processes. The cells in Clarke's columns are supposed to be connected with the fibres of the direct cerebellar tract, and possibly

with Lissauer's tract. Gaskell, however, believes that these cells are in relation with the vaso-motor and visceral nerve fibres which pass out of the cord by the anterior roots.

Anterior and Posterior Nerve-Roots.—Some of the anterior roots enter the anterior cornua directly and end in the ganglionic cells, some probably pass into the anterior grey matter at a different level after a short course in the anterior mixed region, and some cross to the anterior horn on the opposite side through the anterior commissure. The fibres of the posterior roots at their entrance into the cord divide into two bundles, the external and internal radicular fasciculi. The former passes into the substantia gelatinosa, some of the fibres entering the anterior commissure and finally reaching the cells of the opposite anterior cornu, some probably proceeding to the posterior vesicular column with the cells of which they are connected. Of the fibres of the internal radicular fasciculus some pass either directly or after a short upward course into the postero-median column; others probably decussate with the fibres on the opposite side in the posterior commissure; others pass into the posterior horn and possibly enter into connection with the cells in the posterior vesicular column.

The Sensory Path in the Cord may be referred to here. On this point our knowledge is still very imperfect. That the afferent fibres cross to the opposite side of the cord soon after their entry is undoubted; but the course and position of the fibres in their upward path to the brain is uncertain. It is probable that tactile sensibility travels mainly by the posterior columns, whereas painful impressions are believed to be conducted in the lateral columns. Many observers are of opinion that the antero-lateral ascending tract is the path for sensibility to pain, but this view must for the present be received with reserve. Impressions from muscles probably traverse the posterior columns, and there is reason to believe that these fibres, unlike other afferent fibres, do not decussate in the cord (*see TOUCH, DISORDERS OF*).

Vascular Supply.—The spinal cord receives its arterial supply from (1) the anterior median artery which courses along the anterior surface of the cord. This vessel is formed by the union of the two anterior spinal branches of the vertebrals. (2) The two posterior spinal arteries, which are also derived from the verte-

brals, and which pass down the cord on each side close to the posterior roots. In addition, small branches from the inferior thyroid, the intercostal and lumbar arteries, proceed to the cord and its membranes. From the anterior and posterior spinal arteries small vessels penetrate the cord, those from the former entering by the anterior median fissure, those from the latter for the most part accompanying the posterior-root fibres. These intra-spinal twigs ramify within the cord and anastomose with one another. From the anterior and posterior spinal arteries a plexus of arterioles in the pia mater is derived, and from this source numerous arterioles pass inwards to supply both grey and white matter. To the disposition of the main vessels must probably be ascribed, as the late Dr. Moxon pointed out, the peculiar liability of the lower part of the spinal cord to softening. The small calibre of the anterior and posterior spinal arteries, their unusual length, and the fact that the reinforcing vessels from the lumbar arteries have to pursue a much longer course than the analogous arteries in the cervical and dorsal regions predispose the lower portion of the cord to vascular changes. In consequence of the long and tortuous course of the spinal arteries the blood pressure is very low, and to this must be ascribed their relative immunity from rupture.

LOCALIZATION OF FUNCTION IN THE SPINAL CORD.—The various purposive movements of the trunk and limbs are controlled by special centres in the spinal cord.

Cervical Enlargement.—The upper part contains the centres for the muscles of the neck (mainly the sterno-mastoid and upper part of the trapezius).

The *diaphragm* is represented by the grey matter at the level of the fourth cervical nerve-roots.

Deltoid, scapular muscles, pectoralis, and serratus at level of fifth and sixth nerve-roots.

The clavicular part of the pectoralis is associated in action with the serratus, the costal with the latissimus dorsi. The centres lie close together, but are distinct.

Flexors of the elbow and supinators at nearly the same level as deltoid—namely, at fifth and sixth nerve-roots.

Extensor of the elbow (triceps) chiefly at level of seventh nerve-root.

Extensors of the wrist above centre for elbow, at sixth and partly at seventh nerve-root.

Flexors of wrist and pronators below

extensors, at level of seventh and eighth roots.

Long extensors of fingers about level of sixth root.

Long flexors of fingers below extensors at level of seventh and eighth roots.

Intrinsic muscles of hand at level of eighth cervical and first dorsal, the interossei being represented at the lower level, the thenar muscles at the upper.

LUMBAR ENLARGEMENT.—The localization here is not so definitely known as in the cervical region. The probable positions of the various centres are as follows: cremasteric at second lumbar, psoas at second, iliacus at third, adductors at fourth, glutei at fourth and fifth, extensors of knee at third and fourth, flexors of knee at fifth and first sacral, the muscles of the leg by various centres at level of fourth and fifth lumbar and first sacral, the intrinsic muscles of the foot at the second sacral nerve-root.

Influence of the Cord over Nutrition.—The nutrition of the muscles is controlled by the large multipolar cells in the anterior grey matter, through the anterior roots and the motor nerves. Disease of these cells, nerve-roots or nerve-trunks gives rise to rapid muscular wasting with paralysis, loss of faradic excitability, and loss of reflex irritability.

The nutrition of bones and joints is also under the influence of the spinal cord, probably through the motor cells. The nutrition of the skin is supposed to be controlled through the posterior roots (see TROPHIC DISORDERS).

Visceral Control.—The spinal cord contains independent centres for the viscera, of which the bladder, rectum and uterus are the most important. The centres for these, as well as for that controlling the sexual function, are situated in the lumbar region.

Reference has already been made to the path for the conduction of motion and sensation. Co-ordination and its disorders are dealt with under LOCOMOTOR ATAXIA. The reflex functions of the cord and its varieties are described under REFLEXES, SPINAL. W. B. HADDEN.

SPINAL CORD, HÆMORRHAGE INTO (Hæmatomyelia; Spinal Apoplexy).—Hæmorrhage into the substance of the spinal cord may be either primary or secondary. As regards the latter it may be briefly said that hæmorrhages are apt to occur at any stage of myelitis, and in tumours of the cord. Apart from pre-existing disease, small hæmorrhages are occasionally

found in the grey and white matter in all conditions causing chronic venous congestion, and in such affections as convulsions and tetanus.

Symptoms.—When motor or sensory disorder has existed for a few days or weeks, a sudden exacerbation is probably due to hæmorrhage occurring in the course of acute central myelitis. In more chronic affections, such as tumour, any abrupt change for the worse is also frequently dependent on secondary hæmorrhage.

In idiopathic spinal apoplexy the onset is quite sudden, and the symptoms rapidly attain their greatest intensity; violent spinal pain, and sometimes tenderness, local or diffuse, are frequent. The paralysed muscles are flabby, all the forms of sensibility are abolished, the reflex actions below the seat of disease disappear, the bladder and rectum are paralysed, cystitis results, and acute bed-sores form. When the hæmorrhage is above the lumbar region, reflex action soon reappears in the lower limbs, and later, descending degeneration ensues. Reflex action then becomes exaggerated and contractures of the legs supervene.

Secondary inflammation often succeeds the hæmorrhage, and within the next ten days or so death may follow. The symptoms in any case vary according to the size and position of the hæmorrhage. Small extravasations may be accompanied by slight and indefinite symptoms. When hæmorrhages involve the anterior grey cornua, as they frequently do in the cervical and lumbar regions, permanent wasting localized to certain muscles, will be the result.

Diagnosis.—The chief points of difference between myelitis and hæmorrhage have already been pointed out (see MYELITIS). In spinal meningeal hæmorrhage, there are signs of irritation, such as hyperæsthesia and spasm; whereas paralysis and impaired sensibility are comparatively slight. In acute anterior polio-myelitis, there is some initial fever, sensory disorders are absent, the bladder and rectum are unaffected, and bed-sores do not form.

Prognosis.—The higher the seat of the hæmorrhage the more grave is the prognosis as regards life. When the cervical region is implicated some of the respiratory muscles are involved, and if the hæmorrhage be above the origin of the phrenic nerve, death will ensue.

When recovery follows an attack of spinal apoplexy, some loss of power and,

very commonly, some muscular atrophy are permanent.

Morbid Anatomy.—Idiopathic spinal apoplexy almost invariably occurs in the central grey matter, this position being no doubt determined by the fact that the vessels are there more numerous and less supported than in the white matter. The hæmorrhage often extends a considerable distance vertically, and the substance of the cord around the clot is broken down, ragged, and, at a later stage, exhibits inflammatory changes. The effused blood undergoes the usual alterations of colour, and finally, if life be prolonged, a cyst may be formed. The cord is often swollen at the seat of hæmorrhage, and occasionally the white substance is lacerated and blood may escape into the membranes. The cervical and upper dorsal regions are most commonly affected.

Ætiology.—Spinal apoplexy is more frequent in males than in females, and most often occurs in youth and middle age. Injury is the common exciting agent. Over-exertion and exposure are said to be rare causes. It is curious that spinal hæmorrhage is but rarely found in those who are the subjects of arterial degeneration, this immunity being, doubtless, due to the arrangement of the vascular supply of the cord.

Treatment.—Absolute rest in the prone position should be enforced. An ice-bag should be applied to the spine. A few large doses of ergot, half a drachm of the liquid extract or five grains of ergotin, should be given at intervals of two or three hours. Cystitis and bed-sores will demand the ordinary treatment. At a later stage baths and the use of the constant current to paralysed and wasted muscles may be found of service.

W. B. HADDEN.

SPINAL CORD, HYPERÆMIA OF.—Hyperæmia of the spinal cord and its membranes has been described, usually quite gratuitously, as following on various conditions, such as sexual excitement, exposure to cold, suppression of habitual discharges, and some of the acute specific fevers. Acute hyperæmia, however, without doubt occurs in the early stage of inflammation, and as a secondary condition in some cases of hydrophobia, tetanus, and strychnia poisoning. Passive hyperæmia is present in the cord, as in other organs, in chronic diseases of the heart and lungs.

The chief *symptoms* of acute spinal hyperæmia are said to be pains along the

spine, relieved by assuming the prone position, slight sensory disorders with subjective sensations in the extremities, tremors and jerkings of the muscles, and erection of the penis.

Treatment.—The remedies suggested are leeching, the application of ice-bags to the spine, the recumbent position with the face downwards, saline purgatives, ergot, and belladonna.

W. B. HADDEN.

SPINAL CORD, SLOW COMPRESSION OF.—The subject of slow compression of the cord is also dealt with in part under the head of SPINAL CORD AND ITS MEMBRANES, TUMOURS OF. Here the symptoms will be discussed in a more general way, and the main distinguishing features between the various forms of compression myelitis pointed out.

The *symptoms* come under three categories, namely, (1) those of vertebral disease, (2) those due to pressure on the nerve roots, (3) and those due to pressure on the cord.

(1) **Vertebral Symptoms** occur especially in three conditions: caries, malignant growths, and eroding aneurysms. When there is irregularity or curvature of the spine, the cause of a slow compression-myelitis is unmistakable. Apart from deformity, pain in the spine increased by movement, localized tenderness and rigidity are significant of caries. Sometimes the signs of bone disease are so slight, that their importance is apt to be underrated. Since caries is the most common cause of slow compression of the cord, frequent examinations of the spine should be made in every case of compression-myelitis of doubtful nature, and the possibility of Pott's disease must not be hastily excluded.

Malignant growths involving the vertebræ may give rise to a rounded prominence of the spine, which may be mistaken for caries. The diagnosis between these two conditions may be impossible in the early stage, but it is well to bear in mind that spinal pain from malignant disease of the vertebræ is less severe and less influenced by movement than in caries.

(2) **Extrinsic or Root Symptoms** vary much in degree, in frequency, and in distribution in the various conditions, which give rise to compression. A feeling of constriction in the chest or abdomen (the so-called girdle-pain) may be present, or severe pains of a neuralgic kind, often accompanied by hyperæsthesia and occasionally by the development of an ery-

thematous, vesicular or bullous eruption in the course of certain nerves, may be experienced. Patches of anæsthesia are apt to develop in the hyperæsthetic areas, the pains still persisting (*anæsthesia dolorosa*), and at a later period when destruction of the sensory nerve roots has advanced marked cutaneous insensibility supervenes. Pressure on the anterior roots give rise to slow paralysis and muscular wasting.

(3) **Spinal Symptoms** usually succeed those due to compression of the roots. Gradual loss of power attacks the parts innervated by the cord below the seat of disease, sometimes the lower limbs only being affected, sometimes both upper and lower limbs, together with the muscles subserving respiration. The distribution of the motor paralysis and anæsthesia may be irregular. When, for example, pressure is exerted on one side of the cord, hemi-paraplegia results, motor paralysis without affection of sensation being present on the same side as the lesion, anæsthesia with preservation of motion on the opposite side. As the disease extends in the transverse direction the paraplegia becomes of the ordinary bilateral type. The paralysed members are affected by painful startings and cramps, and become permanently rigid, the muscles preserving their normal bulk and electrical reactions. The superficial and deep reflexes are exaggerated at an early stage, often when the loss of power is still indefinite and trivial. Clonus, spontaneous and induced, is frequently present. Sensation in the paralysed limbs may be normal, often it is incomplete, occasionally profoundly affected. Loss of control over the sphincters is not invariable. Sometimes an acute myelitis supervenes in slow compression of the cord, and then diffuse muscular wasting with profound and widespread anæsthesia rapidly ensues, the bladder and rectum become paralysed, and acute bed-sores form.

The symptoms of slow compression vary according to the seat of disease. When the cervical region is affected root-symptoms are often present in the arms, such as severe pains and hyperæsthesia followed by anæsthesia, paralysis with muscular atrophy, and abolition of reflex action. Later on, indications of pressure on the cord itself make their appearance, the lower limbs becoming paralysed and rigid. Other symptoms sometimes observed in compression-myelitis in the cervical region, are dilatation of one or both

pupils, with subsequent contraction, unilateral or bilateral sweating, vomiting, difficulty in breathing, dysphagia, slowness of the pulse with syncopic attacks, and occasionally epileptic seizures. When the pressure is exerted on the dorsal region of the cord, girdle pains and intercostal neuralgia, due to compression of the posterior roots, are often early symptoms. Subsequently, the lower limbs become paralysed and stiff, and the reflexes exaggerated.

The *course* of a compression-myelitis varies according to the pathological cause. Slow improvement often occurs in caries, and sometimes there is practically complete recovery. In tumours of the cord and its membranes the disease is usually progressive, and most frequently rapidly so.

Diagnosis.—Compression-myelitis may be assumed when signs of pressure on the anterior and posterior roots precede the indications of interference with the functions of the cord.

Root-symptoms may, however, be slight or absent, and then the difficulty in diagnosis is greatly enhanced. Hemi-paraplegia, followed by signs of a slowly progressing transverse lesion of the cord, points to compression.

The anatomical nature of the compressing agent is often difficult and sometimes impossible to determine.

Caries is usually indicated by the presence of the vertebral symptoms, to which allusion has been made. These may be so slight that doubt as to their significance may arise. It is therefore important to bear in mind that in caries motion is mainly or exclusively affected, that the symptoms are usually bilateral from the first, or soon become so, that pains are not generally severe, and that the functions of the bladder and rectum are often intact.

Paralysis with diffuse muscular wasting and anæsthesia of the arms, preceded by severe pains, such as occurs in cervical caries, may be due to primary chronic spinal meningitis, and especially to that variety known as cervical hypertrophic pachymeningitis. The chief distinguishing points are that in the latter the signs of vertebral disease are absent, and the symptoms arise at a later period of life than is usual in caries.

Vertebral cancer or eroding aneurysms may often be diagnosed by local indications. Apart from these, however, the former may be assumed when there is past or present evidence of growth in the breast, stomach or elsewhere.

Compression from malignant growth of the vertebræ is characterised by the early occurrence of excruciating pains, followed by the usual symptoms of interference with the functions of the cord itself. This form of paralysis has been termed *paraplegia dolorosa*. Meningeal hæmorrhage is indicated by the sudden onset of root-symptoms rapidly followed by paraplegia. The nature of other compressing agents, such as tumours of the cord and its membranes can rarely be determined.

The existence of a gumma or of a tubercular mass may sometimes be surmised from the history of the patient.

Morbid Anatomy.—The membranes may be thickened and adherent. In caries there is frequently inflammatory exudation between the dura mater and the bone, the membrane itself showing marked thickening externally and sometimes internally. The symptoms in caries are due to the pressure exerted by the inflammatory products and the thickened dura mater, rarely from actual displacement of the diseased vertebræ. The cord at the seat of compression is often much narrowed or flattened; its consistence in the early stage is softer than normal, but at a later period it becomes hard from the development of sclerotic changes. On microscopic examination some of the nerve fibres are seen to be disintegrated from acute inflammatory changes, others showing little alteration beyond reduction in size. Interstitial overgrowth is commonly present. The central grey matter exhibits the changes seen in acute myelitis though to a less degree. The nerve-roots are often grey, atrophied and degenerated. Above and below the seat of compression the usual secondary degenerations are present.

Treatment.—Prolonged rest in the recumbent posture, tonics, cod-liver oil, and counter-irritation by the actual cautery over the diseased part of the spine, are the chief therapeutic agents in paraplegia from caries. The usual measures for the avoidance of bed-sores and cystitis should be adopted. Suspension has been advised by some authorities. For the description of this method (*see* LOCOMOTOR ATAXIA). In obstinate cases the spine has been trephined, and the inflammatory products and diseased dura mater removed. Such a procedure should only be adopted in exceptional cases, since recovery of power in caries may take place after a very prolonged period of paralysis. Tenotomy or extension by splints may be necessary to

remedy deformities of the limbs when muscular power is regained. Electricity should only be employed when rapid muscular atrophy has supervened. In chronic meningitis, which is sometimes of syphilitic origin, iodide of potassium is of service, and counter-irritants may be used. In meningeal hæmorrhage, absolute rest, the application of ice to the spine and the administration of ergot are indicated. The treatment of other cases of compression-myelitis will be found under SPINAL CORD AND ITS MEMBRANES, TUMOURS OF.

W. B. HADDEN.

SPINAL CORD AND ITS MEMBRANES, TUMOURS OF.

—In describing tumours of the spinal cord and its membranes, it is essential to include growths involving the vertebræ, since these latter by extension, frequently give rise to symptoms due to pressure on the nerve-roots and cord.

The vertebræ are sometimes affected by primary or secondary growths, usually carcinomatous or sarcomatous, less commonly myxomatous. Carcinomatous disease of the spinal column is often secondary to malignant disease of the breast, stomach or other organ, and occasionally results from invasion of growths within the abdomen and thorax. It may be mentioned here that aneurysm of the abdominal aorta eroding the vertebræ may give rise to pressure on the cord and nerve-roots. In very exceptional cases, exostoses growing from the bodies of the vertebræ have extended into the spinal canal and caused pressure-symptoms.

Tumours Originating within the Spinal Canal.—(a) Hydatid cysts and lipomata are found, though rarely, in the loose alveolar tissue between the dura mater and spinal canal.

(b) The tumours involving the membranes are mainly gummata, sarcomata, fibromata, myxomata and tubercular growths; more rarely hydatids, cysticerci and lipomata.

(c) Growths originating within the cord itself are chiefly gliomata, gummata, tubercular tumours, sarcomata and myxomata.

Multiple tumours may arise either from the membranes or in the cord. In the former case, they are usually neuro-mata or sarcomata, in the latter, tubercular. Tumours of the cord have a limited transverse extent, but vertically they may pass for a considerable distance. By the pressure of growths, mainly those

connected with the membranes, the cord may become narrowed and flattened, and usually the ordinary ascending and descending degenerative changes occur. Extrinsic tumours rarely extend into the cord.

Myelitis, of more or less acute course, is not uncommon in cases of tumour within the cord, as well as in growths arising from the membranes and exerting pressure from without. Tumours of the cord often originate in the peri-ependymal tissue, and in such instances the central canal, which is obliterated at the site of the growth by pressure, is found dilated higher up (syringo-myelia).

Symptoms.—(1) *Tumours originating in the substance of the cord.*—The symptoms at first are often vague; later on sensation and motion are apt to be affected below the seat of disease and muscular atrophy from involvement of the anterior cornua may be present. Sometimes, as for example in central tumours, the symptoms are bilateral from the first; in other cases, when the growth is unilateral, cross paralysis is present at the outset, followed at a later period, in consequence of the horizontal extension of the growth, by the slow supervention of other symptoms.

Tumours of the cord are not usually attended with severe radiating pains or with pain, tenderness, and rigidity of the spine. In this respect they differ materially from growths arising from the membranes. The localization of a cord tumour may usually be determined by the level to which the motor and sensory symptoms extend and by the condition of the skin and tendon reflexes.

(2) *Tumours arising from the membranes* usually involve the sensory and motor nerve-roots at an early period. In most cases there is intense radiating pain, often limited for a long time to a definite spot or to the distribution of certain nerves. At a later period, as the growth extends beyond its original limits, sensory symptoms referable to other nerve-roots supervene. Hyperæsthesia is often present. Gradual impairment of sensation, commonly ending in complete anæsthesia, frequently occurs in the area in which the severe pains are felt. Twitchings and temporary spasm of certain muscles are of frequent occurrence and depend on irritation of motor nerve-roots. Paralysis, sometimes accompanied by rapid muscular wasting, almost invariably follows. The paralysis, which is gradual at its outset, usually affects at first one limb or part of a

limb, but as the growth increases and exerts pressure on the cord there supervenes more or less paraplegia, generally attended with rigidity and exaltation of the tendon reflexes. The distribution of the paralysis and the order of the symptoms will depend on the site of the tumour and its rate of growth. Occasionally acute or sub-acute myelitis occurs, and then rapid loss of motion and sensation are superadded.

(3) *Tumours arising primarily outside the membranes*, such as malignant growths of the vertebrae and eroding aneurysms, involve the neighbouring sensory and motor nerves long before the cord is affected. Pain of great severity, often accompanied by hyperæsthesia and followed by anæsthesia, is an early symptom. Muscular paralysis and wasting are frequent. The cord itself is involved late.

Diagnosis.—The chief points of difference between growths of the cord and those arising from without will be evident from the foregoing account. In spinal caries pains are not usually severe, the symptoms are at the outset bilateral or soon become so, and curvature or irregularity of the spine with muscular rigidity makes its appearance.

In cervical hypertrophic pachymeningitis the muscular paralysis and wasting of the arms are usually bilateral from the first, and the sensory symptoms are general in the arms and not limited to the distribution of definite nerve-trunks.

The initial sensory symptoms of tumours, especially those involving the nerve-roots, are sometimes looked upon as neuralgic, but the extreme severity of the pains and the constancy of their seat are highly suggestive.

Tumours of the cauda equina often give rise to pain in the course of both sciatic nerves. The bilateral character of the pain is significant, but not sufficient to warrant a diagnosis of tumour. The gradual onset of other symptoms will usually make the nature of the case clear.

A surmise may sometimes be made as to the anatomical nature of a growth, provided that the symptoms clearly point to tumour, by the existence of a syphilitic or tubercular taint in the patient. Symptoms of irritation of nerve-roots or of pressure on the cord occurring in a subject suffering from malignant disease of the breast, abdomen, or other part of the body are unmistakable in their significance.

Prognosis.—In all cases except gum-

nata the prognosis is very grave. The duration of life varies from a few months to two or three years. In exceptional cases, in which the tumour is of exceedingly slow growth, life has been prolonged for as long as ten years.

Treatment.—When there is any possibility of syphilitic taint, large doses of iodide of potassium, with or without mercury, should be given. In other cases drugs are only of service for the purpose of alleviating pain. Local applications of aconite, belladonna and the like may be used. Sedatives, such as cannabis indica, cocaine and opium are almost always necessary. Recent advances in surgery have shown that tumours of the membranes may be removed successfully. A full account of the method of procedure will be found in the paper by Dr. Gowers and Mr. Horsley in the *Medico-Chirurgical Transactions*, vol. lxxi.

W. B. HADDEN.

SPINAL PARALYSIS, SUB-ACUTE AND CHRONIC ATROPHIC (Sub-acute and Chronic Anterior Polio-myelitis; General Spinal Paralysis).—This disease was originally described by Duchenne in 1849, who termed it "Paralysie générale spinale antérieure subaiguë." The affection frequently assumes a chronic course, although not differing essentially in other clinical characters from the sub-acute form. This distinction into sub-acute and chronic is arbitrary, and hence the two varieties must be regarded as one disease.

The disease is characterized by paralysis followed by atrophy involving first the lower and then the upper extremities. The muscles present the reaction of degeneration. Sensation is preserved, and the bladder and rectum are unaffected. The anatomical change is atrophy of the ganglionic cells in the anterior grey matter of the cord.

Symptoms.—Very frequently at the onset, more particularly in the sub-acute cases, the patient complains of fatigue, pains in the back and limbs with tingling and sensations of numbness, and occasionally there is some pyrexia and general constitutional disturbance. The paralytic symptoms begin with muscular weakness of one or both lower limbs. After a variable period there is distinct paralysis, and later on the affected muscles waste. The flexors of the foot on the leg are apt to suffer first, then the flexors of the thigh, and subsequently the extensors of the leg on the thigh.

The paralysis and wasting, whatever be their distribution, attack the muscles in a progressive manner, and extend slowly from the lower to the upper limbs. In rare instances the arms are attacked first, but the rule is for the upper limbs to be involved a few weeks or even months after the onset. The fingers and hands are more affected than the other parts of the upper limbs. The extensor muscles on the backs of the forearms are often attacked early and suffer severely. In some instances the muscles of the back, abdomen and neck are implicated, usually at a late stage of the disease. In severe cases there is extension to the medulla oblongata, with its attendant dangers. The affected muscles generally present the reaction of degeneration, though it is said that in some of the chronic cases there is simple loss to both currents. There are commonly fibrillar twitchings of the atrophied muscles. The skin and deep reflexes are abolished in the paralysed parts. It is important to bear in mind that throughout the disease sensation remains unimpaired, the functions of the bladder and rectum are preserved, and there is no tendency to the formation of bed sores.

The Course of the Disease is variable. In many cases the wasting and paralysis, after slowly progressing for months or years, remain stationary, subsequently undergoing great improvement, and occasionally a practical recovery is effected. Partial recovery is more common, certain muscles or groups of muscles remaining permanently wasted. Broadly stated, amelioration is more marked in the sub-acute form, though even in very chronic cases great improvement, and occasionally actual recovery may take place. When death occurs it is usually from exhaustion, or from respiratory disorder dependent on implication of the medulla oblongata.

Diagnosis.—In the acute anterior polio-myelitis of adults (adult spinal paralysis) the invasion is abrupt and the muscles are affected coetaneously. In this latter respect adult spinal paralysis differs essentially from general spinal paralysis, in which there is slow extension from part to part.

In progressive muscular atrophy the paralysis and wasting are simultaneous and proportional, whereas in general spinal paralysis the weakness precedes the muscular atrophy. In general spinal paralysis also the atrophy is diffuse and attacks almost always the lower limbs first, thus differing essentially from pro-

gressive muscular atrophy. The course of the two diseases and the electrical reactions of the muscles are different, and in a doubtful case these points should be taken into consideration in differentiating the affections.

As regards amyotrophic lateral sclerosis, the paralysis precedes the atrophy as in general spinal paralysis. In the former, however, the arms are first attacked, and, what is more important, there is rigidity with exaltation of the tendon reflexes from the very onset. Acute ascending paralysis presents many points of resemblance to acute spinal paralysis, to which reference is made elsewhere. Certain cases of ascending paralysis are of slower development than usual, and then this disease has some features in common with the subacute variety of general spinal paralysis. In the former, however, the muscles do not waste, and their electrical reactions are unchanged—two points of primary importance in diagnosis. Until lately many affections of the peripheral nerves, such as alcoholic neuritis, were ascribed to disease of the anterior grey matter of the spinal cord. In multiple neuritis sensory defects are often temporary, and it therefore happens that great difficulty may exist in differentiating between it and polio-myelitis of subacute or chronic course. It should be borne in mind, however, that defective sensation, persistent pains in the limbs, and the existence of hyperæsthesia of the muscles and nerve-trunks are characteristic of multiple neuritis.

Morbid Anatomy.—In the few recorded cases in which the spinal cord has been examined, there has been found atrophy of the cells in the anterior grey matter together with degeneration of the anterior roots. Some degree of sclerosis, particularly of the anterior columns, has also been described.

Ætiology.—The causes of the disease are obscure. Injuries, exposure to cold and damp, alcoholism and lead-poisoning have been looked upon as exciting agents. The onset usually occurs between the ages of thirty and fifty.

Treatment.—Reliance is to be placed chiefly on massage of the affected limbs and the use of electricity, especially of the continuous current.

W. B. HADDEN.

SPLEEN, DISEASES OF.—The spleen is very seldom the seat of primary disease. But little is known of its being acutely inflamed or the seat of

suppuration, except in regard to the condition of acute swelling, to which it is liable in certain infectious diseases as typhoid, acute tuberculosis or pyæmia. But obviously in such cases the spleen is affected only secondarily. It is rare or almost unknown for new growths to originate in this organ, and, indeed, with the exception of splenic leucocythæmia, there is hardly any condition in which it can be said to be primarily affected. A few only of the more common lesions need be here referred to.

Chronic Venous Congestion.—This condition results from long-standing cardiac disease or obstructed portal circulation, as in cirrhosis of the liver. It is sometimes characterized by enlargement and always by induration of the organ. In those cases in which the spleen is not enlarged there is generally great thickening of the capsule (perisplenitis), which may explain the lack of increased size. The induration is due to great fibroid thickening of the trabeculæ. The organ is full of blood and has a dark colour on section. Beyond its palpability, and an increased area of dullness, there are no signs of the condition during life.

Hæmorrhagic Infarction occurs frequently in the spleen in cases of chronic heart disease, the source of embolism being either valvular vegetations or thrombi in the left cavities of the heart. A recent infarction is wedge-shaped, the base of the wedge being beneath the capsule, where it bulges prominently above the rest of the surface of the organ, the apex being directed towards the centre. The infarct has a deep red colour, and is sharply demarcated from the splenic tissue on section both by its colour and also by its consistence, which is firm and solid. The appearance has been aptly compared to that of damson cheese. Careful examination of the branches of the splenic artery will show that the branch supplying the affected area is occluded by a clot, and Cohnheim's explanation of the hæmorrhage is that the splenic arteries being "terminal," the territory cut off from its normal arterial supply is engorged with blood which flows back into it from the veins (*see also* EMBOLISM). Later the wedge-shaped area becomes decolorized, of a canary-yellow colour, and transformed into granular and fatty detritus with blood-pigment; but how long a time must elapse before an infarct undergoes this change is quite undetermined. Later still it shrinks in

bulk and becomes surrounded by a more or less dense and pigmented investment of connective tissue, so that little but a depressed tough cicatrix remains at the site of the original infarct. It is not unusual to find these lesions in all stages in the same spleen or in the advanced stage only, where they remain as prominent indications of previous blockage of the splenic arteries. Such infarcts do not tend to soften; but if the embolus be derived from a septic source, as in pyæmia or ulcerative endocarditis, *abscesses* will result. In the case of ulcerative endocarditis the infarcts are usually minute, represented in the early stage by scattered hæmorrhagic foci, and soon breaking down into minute (miliary) abscesses (see EMBOLISM).

Symptoms.—The occurrence of splenic embolism may be suspected when in the course of heart disease the patient suddenly experiences pain in the splenic region, and there is (especially in ulcerative endocarditis) also a rigor and a sudden rise of temperature concurrently with the pain. The organ, if palpable, is tender on pressure, and sometimes a friction sound can be heard the following day on auscultation in the lower axillary region.

Albuminoid or Waxy Disease.—This condition of the spleen is met with in two forms—one in which the degeneration is mainly limited to the Malpighian bodies (sago-spleen), and the other in which these structures are atrophied and fibrous, and the change involves the walls of the sinuses and blood-vessels (diffuse waxy spleen). In the former condition the organ is generally enlarged, and on section presents a number of closely aggregated translucent or glistening areas which correspond to the swollen waxy Malpighian bodies. In the latter the whole organ is increased in consistence and has a glistening appearance. The “sago” condition is the more common.

The *diagnosis* of albuminoid disease of the spleen is made during life when in a chronic suppurative disease or in a syphilitic subject, the organ is found to be enlarged, its margin firm and rounded, and there is in addition enlargement of the liver and albuminuria. At the same time the degeneration may be more advanced in one organ than in another, and it is not invariably the rule for liver, kidney, and spleen to be all affected.

There is a condition met with in rickets and infantile syphilis which leads to enlargement of the spleen, to which the

name of “albuminoid” degeneration is given by some writers. It is not the same change as that above described, and by some it is regarded as a mere hypertrophy of the organ.

Enlargement of the Spleen.—Apart from the above-named conditions, enlargement of the spleen occurs more or less acutely in most infectious fevers, especially when the pyrexia is high. The organ is markedly involved in typhoid fever, in which disease it may attain a considerable size. In all febrile states the swollen spleen is softer than natural, pale, or sometimes engorged. The spleen is also characteristically enlarged in malarial fever (*q.v.*), in leucocythæmia (*q.v.*), and in Hodgkin's disease (*q.v.*).

The clinical evidences of splenic enlargement are: (1) An increase in the normal area of dulness; (2) the detection, by palpation, of the lower and anterior margin of the organ, the “notch” in the latter being sometimes readily felt; (3) the direction taken by the enlarging organ, viz., downwards and forwards, in front of the intestines; (4) its mobility with the movements of the diaphragm.

A *diagnosis* has to be made from displacement of the spleen, as in left-sided pleuritic effusion or pneumothorax, and from a tumour of the left kidney which may come into contact with the spleen. In the former case the presence of the thoracic disease is readily determined, and in the latter the relations of the renal tumour to the colon (which is pushed forwards in front of it), as well as the existence of urinary symptoms and hæmaturia, may aid in the differentiation, which is, however, in some cases difficult.

Tubercular Disease occurs only as a part of a general tuberculosis, and in two forms:—(1) Miliary grey granulations, which may thickly stud the parenchyma and also be met with on the capsule; (2) large yellow granulations of the size of peas, firm and caseous.

Syphilitic Gummata are occasionally observed, mostly as masses of caseous or semi-calcified substance with dense fibrous investment, often associated with considerable thickening of the capsule.

Secondary Malignant Growths (sarcoma and carcinoma) are also occasionally found in cases of malignant disease, but the spleen is not a usual site for them. In Hodgkin's disease the enlarged organ is the seat of nodules of lymphatic new growth.

Hydatid Cysts are not nearly so com-

mon in the spleen as in the liver or lung, and seldom attain any large size in this organ. Their presence may thus be quite unsuspected during life, and, when found, they are mostly more or less degenerate and calcified.

The spleen during the **Ague paroxysm** undergoes temporary enlargement so as to become palpable. In fatal cases the organ is found to be swollen, soft, and congested, presenting hæmorrhages in its substance. In those who have been the subjects of malarial fever the spleen may become permanently enlarged. Anatomically it is then characterized by much fibrous induration and marked pigmentation (melanæmic spleen).

SIDNEY COUPLAND.

STERCORACEOUS is a term used in reference to vomited matters which possess a fecal odour and appearance, a condition met with in the course of intestinal obstruction and strangulated hernia (*see also* **ULCERATIVE COLITIS AND ENTERITIS**, **E. Stercoral Ulcers**).

STERILITY.—This may be either absolute or relative. Absolute sterility means that the patient does not become pregnant at all, or, if she become pregnant, miscarries so early that the pregnancy cannot be recognized. Relative sterility means that the patient does not produce as many healthy children during the time she lives in wedlock, as women upon the average do. Both kinds of sterility are produced by causes of the same kind, and the causes which in many women produce absolute or relative sterility, in others produce pregnancy resulting in abortions, monsters, plural births, and idiots.

The cause of sterility in a female may be either local or constitutional. The latter are the more common, but the former are the better understood, and more often remediable. Among the constitutional causes are deprivation of health from any cause, especially such as produce amenorrhœa. These probably act by preventing the proper formation of the uterine decidua, to which the impregnated ovum should become attached, and so retained *in utero*. The ill-understood condition of health which is attended by the excessive production of fat, often causes sterility. Habitual alcoholic excess (not necessarily to the point of drunkenness) may produce it. Marriage at an unsuitable age is probably the commonest of all causes of sterility. The marriages which most often

result in the production of healthy offspring are these which take place when the wife is aged between twenty and twenty-five. Before that age the wife is more likely to be sterile than at that age; and after twenty-five the likelihood of her proving sterile increases with age, especially after thirty. A woman may be still menstruating and yet have lost fecundity. Too close intermarriage of families often results in sterility. In some instances a tendency to sterility seems to be inherited, as in the frequent sterility of heiresses. Among the local causes, the commonest, and the one most often curable, is spasmodic dysmenorrhœa (*see* **DYSMENORRHŒA**). Barrenness may be due to absence of the uterus, or to deficient development or atrophy of the uterus and ovaries. We can only detect smallness of the uterus, for there is no method of examination fine enough to reveal the condition of the ovaries as to development. But as pregnancy may take place in an undeveloped uterine horn, it is probable that in a woman with a small uterus who is sterile, the ovaries share in the imperfect development of the sexual organs. In such cases the stimulus of marriage may sometimes bring about slow development of the generative organs, but this is rare. Disease of the uterus, such as fibroids, cancer of the body, or diseases of the Fallopian tubes, causing them to be blocked, may cause sterility. Excessive sexual intercourse may produce sterility, as is seen in the infrequent pregnancies of prostitutes. This possibly acts by producing a monthly miscarriage. Cervical endometritis has been stated to cause sterility, but there is abundant evidence to the contrary. Endometritis of the body of the uterus has been with more reason credited with sterility as its effect, but we have no exact knowledge as to the forms of this disease which cause sterility. Uterine displacements have had sterility attributed to them, but no evidence has ever been adduced to show that this is so in the smallest degree, and there is no doubt that pregnancy may take place with any displacement except inversion.

Statistics prove that until a patient has been married for three years without pregnancy, there is still a probability of offspring, which seems to show that there are some causes of sterility existing at the time of marriage which are capable of natural cure. It must be remembered in the investigation of any case of sterility that the cause may be in the hus-

band, and not in the wife. As this is so in a large proportion of cases, no treatment of a woman of a dangerous or protracted character should be undertaken on account of sterility, until inquiries have been made on this point. Lastly, sterility in a given couple may not be due to any disease either in husband or wife, but simply to an incompatibility (the nature of which we do not understand) between the germ cell and the sperm cell; for occasionally instances are met with in which a woman is sterile in marriage with a man who has had children by another wife, and herself is fertile when married to another husband.

G. E. HERMAN.

STERTOR: STERTOROUS.—

The noisy breathing of a person in a state of coma.

It is due to a paralytic condition of the muscles of the lips, cheeks, tongue, fauces, and soft palate, the latter becoming a flaccid curtain moving to and fro with respiration, a similar movement being often seen in the lips and cheeks. The tongue falls towards the posterior wall of the pharynx, mucus collects within the mouth and becomes frothy by admixture with the tidal air, the result being a snoring noise, in the production of which all the above-mentioned conditions have some share.

STOMACH, CANCER OF.—Cancer of the stomach is, as a rule, primary; but the disease may extend to the stomach from other organs. The epithelial, the encephaloid, the colloid, and the scirrhus varieties of cancer all occur in the stomach, the last being the most common. Any part may be affected, but the pylorus is the most frequent seat. The growth may infiltrate or be localized, it may form tumours or ulcerate, and may extend from the stomach to other organs.

Symptoms.—When the cancer is not pyloric, the symptoms are somewhat similar to those of gastric ulcer (*vide infra*), but hæmorrhage is more frequent, and usually occurs in small amounts at a time. Cachexia and wasting are marked from an early period. The bowels are usually confined. Sarcinæ and torulæ may be found in the vomita, which will also present the appearance known as "coffee ground," when there is bleeding from the surface of the growth. In pyloric cases the symptoms agree with those described under PYLORUS, OBSTRUCTION OF.

The *physical signs* vary according to the seat and extent of the growth. Local tenderness is usually present, but is less acute than in cases of ulcer. A sense of resistance may be felt over the gastric area, and when the growth is in front a distinct tumour can usually be detected. The characteristics of a tumour of the stomach are fully described in the article on ABDOMINAL TUMOURS.

Diagnosis.—This is often a matter of great difficulty; speaking generally, it may be said that in the absence of a distinct tumour it is rarely safe to come to a diagnosis of cancer of the stomach, so closely are the symptoms in some cases simulated by those of chronic ulcer. This subject is discussed in the article above referred to (page 5), and also in the article on HÆMATEMESIS.

The *prognosis* is necessarily fatal. Death occurs from exhaustion, usually in about eighteen months from the commencement of the symptoms, rarely later than two years. The progress of the disease is most rapid, as a rule, in pyloric cases.

Treatment can be only palliative. The diet must be restricted until vomiting ceases and tolerance of food is obtained. If necessary, rectal alimentation must be resorted to and the stomach left at rest. Pain may be relieved by the same means as in gastric ulcer, and fermentation by those described under PYLORUS, OBSTRUCTION OF. Hot turpentine stupes, hot fomentations, &c., are at times useful in relieving the pain. In pyloric cases the operation of gastrostomy may be resorted to as a means of prolonging life.

ISAMBARD OWEN.

STOMACH, DILATATION OF (Gasterectasis).—One of the chief causes of dilatation of the stomach is dealt with in the article on PYLORUS, OBSTRUCTION OF (*q.v.*), but this condition may also arise from muscular weakness, from habitual over-distension with food and drink, and from the excessive use of aerated waters. Rarely it occurs as an acute condition. Little or no hypertrophy of the muscular coat is found in these cases.

Symptoms.—The symptoms, generally speaking, resemble those of obstruction of the pylorus, but pain is either less severe or altogether absent. The vomita may contain bile as well as sarcinæ.

Physical Signs.—The characteristic signs of a dilated stomach are given in the article on ABDOMINAL TUMOURS (p. 5).

Prognosis.—This is favourable in fairly

healthy constitutions, provided treatment be carefully persisted in.

Treatment.—This mainly consists in giving partial rest to the stomach, so that it may gradually recover its muscular tone. Three light meals should be taken each day at intervals of about five hours. Only bland and easily digested forms of food are admissible; they must be free from excess of starchy and fatty matters, and the quantity must be restricted according to the severity of the case. It is important that the patient should take at least an hour's rest in the recumbent posture after each meal. Alcoholic liquors and aerated waters are to be prohibited. Gas-formation should be checked by carbolic acid, &c., as described under obstruction of the pylorus. Other drugs are of little value, but tinct. nuc. vom., in 10-15 minim doses three times a day, may help to restore tone to the gastric wall.

The stomach may each day be washed clear of the mucus which tends to collect on its wall with warm water, either plain or with 5-10 grains of sod. bicarb., added to the fluid ounce. This is best done by employing a long stomach-tube, fitted with a funnel at the upper end, to fill the viscus, and emptying it by lowering the upper end of the tube into a basin. The tube then acts as a siphon. An antiseptic solution may be substituted for the plain or alkaliized water.

The method of proceeding is more fully described in the article on PYLORUS, OBSTRUCTION OF.

ISAMBARD OWEN.

STOMACH, INFLAMMATION OF (Acute Gastritis).—Acute inflammation of the wall of the stomach is almost always due to direct irritation by ingested food or drugs, especially by very hot or very cold drinks, ardent spirits, irritating condiments, and the class of drugs known as irritant poisons (*q.v.*). The condition may also be set up by starvation, and it sometimes arises without known cause, or is attributed to chill. The affection varies, according to the intensity of the cause, from simple catarrh of the mucous membrane to severe inflammation of the whole thickness of the wall, with erosion and destruction of the mucous layer. Membranous exudations and perforations are rarely found; and diffuse suppuration is a condition very seldom met with.

Symptoms.—Pain, more or less acute, in the epigastrium, radiating, if severe, to the back and flanks, is invariably present.

Nausea, retching or vomiting, which may or may not relieve the pain, usually accompany it, whilst anorexia, intolerance of food or drink, which is speedily vomited, thirst and constipation, with pyrexia and febrile malaise, are symptoms seldom absent. In severe cases there may be much prostration and collapse. The tongue is red and dry, or may be furred and denuded of its epithelium in patches.

The *prognosis* is, on the whole, favourable, except in cases due to irritant poisoning. Chronic gastritis may remain after the acute symptoms have subsided (*see* DYSPEPSIA).

Treatment.—Rest in bed is essential, and only small quantities of easily digested food should be given. From half to one teacupful of lukewarm milk, or half the white of an egg beaten up with from half to one teacupful of lukewarm water, should be given alternately with a similar measure of thin gruel or barley water, every two hours. Rectal alimentation may be added if the case threatens to be prolonged.

The application of from four to eight leeches to the epigastrium and hypochondria gives great relief. Hot turpentine stupes, hot fomentations, hot dry flannels, or a large mustard plaster may be substituted, but they are less efficacious.

Liq. morph. hydrochlor. (5-8 min.) may be given every four hours to allay pain and irritation, with 3 min. of ac. hydrocyan. dil. to check vomiting, and 15 min. of glycerin, in 1 oz. of rose water.

If collapse threaten, it may be averted by the injection of 2-4 oz. of brandy per rectum, or of $\frac{1}{2}$ -1 drm. of ether subcutaneously. The medicaments will be reduced gradually, and the diet cautiously increased as convalescence sets in. Alcoholic liquors should be strictly avoided unless collapse be threatened. If chronic catarrh supervene, the case may be treated as one of dyspepsia (*q.v.*).

ISAMBARD OWEN.

STOMACH, ULCER OF (Gastric Ulcer).—Ulcers may occur on any part of the wall, but are most frequently met with on the posterior surface near to the lesser curvature, and to the pyloric end of the organ. The more *acute* forms are found chiefly in females from eighteen to thirty, the more *chronic* in men beyond middle age.

Symptoms.—The symptoms are, as a rule, well marked. Acute pain is complained of. It is referred generally to the epigastrium, but at times to the back,

right or left hypochondrium, right or left flank, according to the position of the ulcer; it is speedily aggravated by food and generally relieved by vomiting. There is often tenderness over the epigastrium, and, if the ulcer be in front, the tender area may be narrowly localized. Vomiting is present from an early period. It occurs, as a rule, within two hours after taking food. Any of the symptoms described under *DYSPEPSIA* may be added; and the patient rapidly wastes. In about half the cases profuse hæmorrhage occurs at rare intervals, the blood being vomited or passed downwards, or both.

Perforation, if it occur, is signalled by sudden severe pain in the abdomen, with collapse; followed by the symptoms and signs of peritonitis.

Diagnosis.—The diagnosis requires to be made from cancer of the stomach and the condition known as *ANOREXIA NERVOSA* (*q.v.*). As regards the former the reader is referred to the articles *STOMACH, CANCER OF*, and *ABDOMINAL TUMOURS, DIAGNOSIS OF*.

Prognosis.—In the great majority of cases the ulcer heals, but it is liable to re-open at any subsequent period. Death may occur from perforation, hæmorrhage, or exhaustion; or from obstruction of the pylorus by cicatrization. The liability to perforation is much less in chronic gastric ulcer than in the acute form.

Pathology and Etiology.—The origin of gastric ulcers is variously ascribed to injury, inflammation, spasm, thrombosis and embolism of minute arteries, but we have no certain knowledge of their cause. They are usually single, and vary in size from a shilling to a half-crown. The more acute forms have flat, clean cut edges and smooth floors, the more chronic are thickened in both. They may be merely superficial, or may penetrate the deeper coats, or actually perforate. In the event of deep penetration, adhesions form between the seat of the ulcer and the neighbouring viscera (*e.g.*, the pancreas), and these adhesions in most cases obviate the consequences of penetration. When deep, the ulcer is conical in shape.

Treatment.—This must be directed to protecting the ulcer as far as possible from irritation and to the relief of the pain and vomiting. At the same time the patient's strength must be supported. Absolute rest in bed is essential during the presence of any acute symptoms. The diet at the outset must be narrowly limited. It is best to commence with

fluid food, milk and plain broth, or one of the malted "infants' foods," given in quantities not exceeding $\frac{1}{2}$ pint at two or three hour intervals. In severe cases, no food whatever should be given by the mouth for a period the duration of which will vary with the severity of the symptoms and the strength of the patient. During this time the patient must be supported by nutrient enemata and nutrient suppositories, one of which may be given alternately every four hours. Bism. subnit. 10 grs. suspended in mucil. acac. $\frac{1}{2}$ drm. may be given every six hours, in order to form a protective coating to the ulcer; and liq. morph. bimec. 3-6 min. and ac. hydrocy. dil. 3-4 min. may be added to this to check the pain and vomiting; tr. belladonnæ 5-10 min. or tr. hyoscyami $\frac{1}{2}$ drm. may be substituted for the morphine.

At the same time portal congestion may be prevented by mild saline aperients,—*e.g.*, 20 gr. mag. carb. and 1 drm. mag. sulph., with $\frac{1}{2}$ drm. tr. hyoscyami, in 1 oz. of peppermint water, taken the first thing in the morning as required. Violent purgation should be avoided.

The amount and solidity of the food may be cautiously increased as the pain and other symptoms subside.

Nitrate of silver ($\frac{1}{4}$ gr. doses) or oxide of silver ($\frac{1}{2}$ gr. doses) in pill may be substituted for the bismuth in the later stages.

The treatment of hæmatemesis will be found under that heading. For the treatment in case of perforation, followed by peritonitis, the article on the latter subject may be consulted.

ISAMBARD OWEN.

STOMATITIS.—Inflammation of the interior of the mouth. This affection occurs under several forms, and great confusion has arisen in their classification. The most distinct varieties are the following:—

1. *Catarrhal Stomatitis*, the mildest and most frequent form, is that produced by irritants, such as, in adults tobacco-smoke, and in children sour milk; infants are specially liable to it, the mucous membrane being peculiarly vascular and delicate. This, which is sometimes termed "erythema neonatorum," varies very much in intensity. In a well-marked case the mucous membrane is much swollen, indented by the teeth or gums, and easily made to bleed; the catarrhal area may be limited, as is often observed in association with dentition. The tongue is

furred, the fur becoming detached in patches, leaving an intensely red surface. The symptoms are pain on sucking or mastication, and salivation.

Ætiology.—Catarrhal stomatitis is generally present in coryza, whooping-cough, measles, scarlatina and typhoid fever.

The *treatment* is simple, the removal of the irritant and the use of a mild astringent lozenge (*e.g.*, tr. krameria) being, in the case of an adult, generally sufficient; in infants and young children, attention to the cleanliness of the bottle, or mamilla, careful cleansing of the mouth after each meal with a soft mop, and the occasional application of glycerine of borax, generally suffice.

2. **Ulcerative Stomatitis** most commonly supervenes as an extension or complication of catarrhal stomatitis. Small ulcers form at points where pressure is exerted by the teeth, or where the mucous membrane is liable to be torn, as at the junction of the lip and gum; in other cases where the catarrhal process is more intense, numerous ulcers rapidly appear, on the cheeks, between the lips and the teeth, under the tongue, and on the hard palate; in a third variety the ulceration starts about the teeth, generally the lower incisors, and spreads along the gums; it may involve the periosteum of the jaw, leading eventually to extensive necrosis and exfoliation of bone. The last two forms are probably infective, and both, but especially that which appears to start on the buccal mucous membrane rather than the gums, are frequently observed in several members of the same family. Copious salivation, great pain on movements of the mouth, and very fetid breath are the marked symptoms; there is commonly some pyrexia, and from the pain and indisposition to eat or drink, the disease is often accompanied by much prostration.

The *treatment* of mild cases, where there is a single ulcer or but few ulcers, consists in the local application of chlorate of potassium (wash or lozenge); in severe cases, small doses of the same drug should be given internally at frequent intervals, best in a mixture with decoction of cinchona. Locally, the liquor hydrarg. perchlor. B.P., or glycerin of borax, or chlorate of potassium should be applied frequently. Washes of nitrate of silver (1 per cent.), permanganate of potassium, or sulphate of copper are also useful. In all cases, but especially where the ulceration has become

chronic or relapses have occurred, the general condition of the patient must be attended to.

3. **Aphthous Stomatitis**, is described under APHTHÆ.

4. **Stomatitis Mycosa** or Thrush is described under THRUSH.

5. **Gangrenous Stomatitis** or **Cancrum Oris** is described under CANCRUM ORIS.

Various other forms of stomatitis, differing chiefly in their ætiology, are also recognized. Thus, *mercurial stomatitis* begins as a catarrhal inflammation of the gums, which quickly runs on to ulceration; the simultaneous effect of the metal on the salivary glands causes profuse salivation, which is very characteristic. Copper and phosphorus produce similar forms of stomatitis; the ulceration if neglected may in time affect the bones. The mucous membrane of the mouth may become infected by diphtheria, and the disease has been known to commence in this situation. In syphilis there is a liability to catarrhal stomatitis in association with mucous tubercles; in hereditary syphilis a general catarrhal stomatitis producing a red glazed condition is an early symptom. The fissures of the lips, or rhagades, frequently extend into the mucous membrane of the mouth, which is then locally inflamed and infiltrated.

DAWSON WILLIAMS.

STRANGULATION.—In death from strangulation the fatal result is due to asphyxia brought about by compression of the air passages from without. Strangulation may be the result of an accident and it is conceivable that a suicide may end his life in this way, but there is always a strong presumption in favour of homicide, and if the marks on the neck showed that manual pressure had been used this would be conclusive of homicide. Usually much more violence is applied than is necessary to destroy life. The condition of the neck will depend upon the nature of the appliances used; a ligature, for instance, will leave a deep circular mark going all round the neck, the mark may be ecchymosed and sometimes the skin is abraded. It is by no means uncommon to find purpuric spots scattered over the trunk. Internally, fracture of the larynx or of the rings of the trachea may be found, or merely congestion of these parts; the thoracic viscera will present the appearances usual in cases of asphyxia, with sometimes superficial em-

physema of the lungs in patches, owing to rupture of the air vesicles. The treatment would consist in freeing the neck from the constricting band, if one existed, a free supply of air, and artificial respiration.

STRANGURY.—An urgent desire to pass urine, frequently recurring, the quantity passed being very small, sometimes a few drops only. The condition is generally accompanied by pain about the neck of the bladder, and the act of micturition is not followed by the sensation that the bladder has been emptied.

The two conditions in which strangury forms a prominent feature are poisoning by turpentine and by cantharides, the latter being sometimes induced by the action of a blister. It is also present in various inflammatory affections of the bladder and prostate, and when those organs are the seat of morbid growths.

The treatment will depend upon the nature of the exciting cause. Morphia and hot baths are, as a rule, the most efficacious remedies.

STROPHULUS.—An old-fashioned term used by Willan and Bateman to designate various ill-defined diseases of the skin which occur mainly in childhood. *Strophulus albidus* is probably identical with milium (see SEBACEOUS GLANDS, DISEASES OF), while *strophulus intertinctus, confertus*, &c., represent various urticarial and sweat eruptions.

STRYCHNINE, POISONING BY.—Strychnine is the alkaloid obtained from the seeds of *Strychnos Nux Vomica*.

Symptoms.—An intensely bitter taste is noticed as the poison is swallowed. The urgent symptoms usually commence suddenly, within twenty minutes of taking the drug. A vague sense of impending danger is experienced, the patient cannot get his breath, declares he is going to be choked, and cries out for more air. Twitching and jerking of the muscles, followed by general tetanic spasms, soon set in, almost all the muscles of the body are attacked at once, those of the back being most affected. During a paroxysm the patient lies on his bed in a state of extreme opisthotonos, his head and heels alone touching the bed, the arms are extended, the feet arched, the abdomen tense, and the chest fixed, so that respiration is greatly impeded; the face and lips are livid, the eyes staring, and the angles of the mouth drawn up so as to produce

the well-known and characteristic “risus sardonicus.” From a half to two minutes is the average duration of a paroxysm. The spasm passes off leaving the patient much exhausted and bathed in perspiration. His sensations warn him of the approach of another paroxysm, and he often screams out or asks to be held. As a rule there are absolutely no cerebral symptoms, and between successive paroxysms the patient often speaks of his impending death. In a case that is likely to terminate fatally the attacks increase in frequency, and the victim dies either from suffocation during a paroxysm or from exhaustion in an interval. The lower jaw is seldom affected until late in the illness. If the patient survive for two hours after the first appearance of the symptoms there is a fair hope of his recovery.

Diagnosis.—The condition has some points in common with tetanus, and might be simulated by hysteria, but a close attention to the symptoms should enable the observer to eliminate the latter without much difficulty. The chief point as regards tetanus is the condition of the lower jaw, in the latter disease the jaw is almost invariably the part first affected, and it remains affected throughout; whereas in poisoning by strychnine it is seldom affected until late, and then only during a paroxysm.

Post-mortem Appearances.—If the patient die during a paroxysm the body is found in a state of opisthotonos, as at the moment of death, otherwise there is nothing outwardly to suggest the cause of death, nor do the internal appearances help much, as a moderate degree of congestion of the cerebral or spinal systems may be all that can be recognized; the blood may be dark and fluid.

Treatment.—Vomiting should be encouraged, and, if the paroxysms have not set in, the stomach-pump may be used. The patient must be kept as quiet as possible, and should not even be touched unnecessarily, for fear of inducing a convulsion. To subdue the convulsions large doses of chloral hydrate or bromide of potassium may be given, separately or together, half a drachm of each for a dose, repeated in half an hour if required, or chloroform may be administered; artificial respiration may be required. Patients often derive much benefit during a paroxysm from being held or rubbed.

SUBSULTUS TENDINUM.—Spasmodic twitching movements of the

tendons, most easily perceived at the wrist. It is a condition met with in severe febrile affections, usually in association with delirium, and is of unfavourable augury.

SUFFOCATION.—Death from asphyxia, the obstruction to respiration being more or less mechanical, but not by violence applied to the throat.

It is usually accidental, very rarely suicidal, except amongst the insane, and occasionally homicidal. Over-lying, or smothering the mouth and nostrils with bedclothes, a towel or cloth, are the methods usually adopted in the latter class, but over-lying may be an accident, though this is not likely if the infant be robust and the mother not intoxicated at the time of the occurrence. Amongst the accidental causes may be mentioned, pressure on the chest in crowds, the passage of food into the glottis, either during the act of swallowing or during vomiting, the passage of blood or pus or a foreign body into the air passages, as in hæmoptysis, rupture of an aneurysm, or the bursting of an abscess in the neighbourhood of the larynx, wounds of the throat involving the trachea, and œdema laryngis, from the swallowing of boiling or corrosive liquids or from simple laryngitis.

The *diagnosis* is generally made from the presence of signs of asphyxia, and the absence of other sufficient cause of death.

Post-mortem Appearances.—There would be the usual signs of asphyxia (*q.v.*), in addition, sub-pleural ecchymoses (Tardieu's spots), consisting of small, round, dark, well-defined spots, are usually seen, especially at the root and base of the lungs, and similar extravasations of blood may be found throughout the lungs.

The *treatment* would consist in the removal of the obstruction to respiration, of whatever kind, if necessary by the performance of tracheotomy, and in the adoption of other measures for restoring natural breathing. The mode of performing artificial respiration is described in the article on DROWNING.

SUNSTROKE (Heat Stroke; Insolation; Coup de Soleil).—A condition resulting from exposure to the heat of the sun or to heat from other sources.

Symptoms.—Three varieties are usually described. 1. **Asphyxial form**, in which death may be almost instantaneous, the onset being sudden, with symptoms of cardiac and respiratory failure, cold skin,

gasping breathing and insensibility. Recovery, if it take place, is usually complete. This is the true sunstroke, resulting from exposure of the head and back of the neck to the direct rays of the sun.

2. **Hyperpyrexial form.**—This follows exposure to great heat from other sources as well as from the direct effect of the sun. It may come on after the exposure has quite ceased, whilst the person is in the shade or even at night. Usually premonitory symptoms are noticed, such as vertigo, headache, nausea, mental confusion, disinclination for exertion, insomnia, thirst, high fever, disordered bowels, or frequent micturition. Insensibility is an early symptom, and supervenes gradually, stertorous breathing in one supposed to be asleep being sometimes the first indication of the condition. There is great restlessness, the breathing is laboured and gasping, the face suffused or cyanotic, the pulse quick and jerking, the temperature very high (108° F. or higher). The pupils in the early stages are contracted, later they may be dilated; the pulse may subsequently become irregular and thready, subsultus tendinum may be present, and epileptiform convulsions, followed by deep coma, occur. Hæmorrhages into the skin are often seen and suppression of urine is nearly constant. Death from gradual asphyxia or from simultaneous cardiac and respiratory failure usually takes place within two days, often very rapidly. In this variety recovery when it occurs is seldom complete, the patient being afterwards unable to endure exposure to excessive heat in any form. Pain in the head, usually limited to one spot, but sometimes diffused, and liable to exacerbations, is a prominent after-effect, loss of memory, irritability, inability to fix the attention, imbecility or even insanity are common sequelæ, and occasionally paralysis or tremor follow the attack.

3. **Syncopal form or heat exhaustion.** The chief features are great prostration, lowering of the body temperature, a cool moist skin and feeble pulse; recovery is generally complete.

Post-mortem Appearances.—Rigor mortis sets in speedily and is followed by early putrefaction. The left ventricle is usually contracted, the right side of the heart and pulmonary vessels being engorged. The blood is generally fluid, and its physical characters altered.

Ætiology and Pathology.—The main cause is exposure to excessive heat, not necessarily to the direct rays of the sun, for it is often met with in stokers,

engine-men, &c.; over-heated air is much better borne when the atmosphere is dry than when it contains much moisture, a fact which is abundantly verified by the experience of the Turkish bath. Predisposing causes undoubtedly have some influence; vigorous persons of temperate habits and in good bodily health are much less liable to be attacked than others. Anything which tends to exhaust or impair bodily vigour will increase the liability to an attack, thus soldiers on forced marches, especially when clothed in a tight uniform, have succumbed in great numbers; sexual or alcoholic excesses are especially dangerous. Acclimatisation has some effect, for in hot countries Europeans suffer more than natives, and new comers more than those who have been some time resident in the district. Persons of spare build are more likely to escape than those who are portly. As regards the actual nature of the affection, it is probable that in the cardiac form the centres in the medulla controlling the circulation and respiration are first stimulated, and then paralysed. The explanation offered by Dr. H. C. Wood of the hyperpyrexial form is that there is an accumulation of heat, as the body is prevented from throwing off the heat which is constantly being formed, and also there is a sudden outburst of heat production. A centre in the pons inhibits the production of animal heat, and another in the medulla regulates the dissipation of heat. On the above theory both these centres must be disturbed (*see* FEVER, section Hyperpyrexia).

Treatment.—The avoidance of all known predisposing causes will go far to prevent an attack. The assiduous application of cold is the most important point in the treatment; this may be effected either by cold baths, douches or packing, or by rubbing the body with ice. A careful watch must be kept on the temperature, so as not to push the treatment to such a degree that the patient is unable to rally. The hypodermic injection of quinine in 10-grain doses, or of antipyrin in 20-grain doses, is worthy of trial. The sequelæ are practically always due to chronic meningitis, and should be treated accordingly.

SUPPOSITORIES are solid cones for insertion into the rectum, to be there dissolved and their active ingredients absorbed. They usually contain as their basis oil of theobroma, glycerin of starch or soap, mixed with which is the

special agent it is desired to employ. The substance introduced into them depends upon the purpose for which they are to be used; most commonly an anodyne effect is desired, when morphine is employed, or occasionally belladonna. Astringents are also used in this way to check diarrhoea, or in cases of constipation some local irritant may be introduced to excite the expulsive action of the bowel. *Nutrient suppositories* are employed where rectal feeding is necessary, either in addition or instead of nutrient enemata. The suppository should be oiled and gently introduced into the anus and slowly pushed up until it is beyond the sphincter, where it may be held for a few seconds to meet any temporary tendency to its expulsion that might at first be excited. Occasionally suppositories are introduced into the vagina; when so used, it is generally for some definite local effect, but sometimes for anodyne or nutrient purposes in cases where such a purpose cannot be effected through the rectum.

SURGICAL KIDNEY (Consecutive Nephritis).—These terms have been given to certain affections of the kidney which are secondary to disease of the lower parts of the urinary tract. They are of several kinds.

1. **Simple Distension** is produced when there is obstruction to the free passage of urine from the bladder or from the ureters. The urine secreted above accumulates, and gradually distends, first the ureters, then the pelvis of the kidney. Afterwards, increasing pressure causes atrophy of the kidney substance in the manner described in the article on **HYDRONEPHROSIS** (*q.v.*). A certain amount of interstitial inflammation is always found in the distended kidney.

2. **Pyelitis, Pyelonephritis, and Pyonephrosis** are occasionally the result of extension of inflammation from the bladder along the ureters to the pelvis of the kidney.

3. **Acute Suppurative Nephritis.**—This is the most characteristic form of "surgical kidney." The kidney is enlarged; its capsule peels off easily; the colour is yellow, mottled with red; the cortex is increased in size. Scattered through the kidney substance numerous small abscesses are observed, which vary in their distribution and shape. Some are found lying between the capsule and the kidney or but slightly invading the kidney substance; these are rounded in

shape. Others are seen to be situated entirely in the cortex of the kidney, and these are of an elongated wedge shape, having the base at the periphery of the cortex. A third kind is found in the medullary portion, and has the form of long yellow streaks running parallel to the straight tubes of the kidney.

On *microscopic examination* it is seen that in addition to the abscess formation there is a considerable amount of cell infiltration of the general interstitial tissue of the kidney, together with proliferation, swelling and degeneration of the cells of the tubules. In fact, combined with the suppuration, there is interstitial and parenchymatous nephritis. By suitable staining agents colonies of micrococci can be demonstrated in various parts of the kidney substance.

4. Interstitial Inflammation.—When this affection is present in the acute stage the kidney has the appearances just described as characteristic of the preceding variety, but without the points of suppuration.

In the chronic stage the kidney is smaller than normal, the capsule is adherent, and the surface granular, in colour yellow mottled with grey. The cortex is diminished in extent. On microscopic examination the interstitial tissue is found to be increased in amount, and the glomeruli and tubules more or less atrophied and degenerated.

5. The Cicatricial Kidney is the final result of some of the former varieties. It is produced by the absorption of the abscesses and the formation of a cicatrix, and by the still further contraction of the increased interstitial tissue. The kidney is irregular in form, always diminished in size, and is converted into a mass of fibrous tissue in which but few renal elements can be detected.

The mechanism of the first and second and also of the last varieties has already been explained. That of the acute suppurative and of the acute interstitial nephritis is still a matter of dispute.

The theories which have been advanced to explain the conditions may be thus summarised:

Simple distension may give rise to irritation of the distended parts, but will hardly account alone for the extreme degree of inflammation occasionally shown in the consecutive nephritis. It has been thought also that the kidney might become inflamed by reflex conveyance of irritation through the nervous system, the primary source of irritation being

situated in the lower urinary tract. This view again would probably not suffice to explain the advent of suppuration, although it has been urged that repeated attacks of congestion produced through the agency of the nervous system, such as have been observed to occur in the kidney after catheterism and other operations on the urethra and bladder, would in time lead to chronic overgrowth of the interstitial tissue of the organ.

It seems now to be certain that the most typical form of "surgical kidney," the acute suppurative nephritis, is produced by the access to the kidney of septic matter proceeding from the bladder. Dr. George Johnson has suggested that by rupture of urinary tubules, there may arise extravasation of urine into the interstitial tissue. Dr. Dickinson holds that the septic urine retained in the pelvis and straight tubes of the kidney under some pressure, transudes into the blood-vessels. The poisonous matter is then carried by the veins to different parts of the organ and is here and there localized in septic thrombi of these vessels. Mr. Marcus Beck, on the other hand, asserts, that it is the lymphatics of the kidney which are mainly concerned in disseminating the poison; that they absorb it from the pelvis and straight tubes, whither it has come from the bladder. The irritating fluid causes desquamation of the epithelium of the tubules and so makes way for its ready absorption.

Dr. Lindsay Steven has shown that the abscesses which are found in the medullary portion of the kidney, are the result of septic poison which reaches the kidney by means of the tubules, but that the wedge-shaped abscesses which lie in the cortex, and between the cortex and the capsule, are caused by septic material absorbed by the lymphatics. He has proved that the lymphatics of the kidney can be injected from those of the ureter and that they pass in from the border into the cortex of the kidney in the direction of the wedge-shaped abscesses. He believes, therefore, that the inflammation of the kidney is due to septic poison absorbed from the bladder or the pelvis of the kidney and conveyed by the lymphatics. This view would appear to be that most consistent with the facts.

Symptoms.—Simple distension of the kidney and ureters causes no symptoms which can be distinguished among those of the cystitis or other trouble which is the primary cause of the condition.

Chronic interstitial nephritis, which usually to a greater or less extent accompanies simple distension, may also give rise to no recognizable symptoms. It may, however, cause the urine to be increased in quantity, and to be of low specific gravity. Any other signs which might have been expected are masked by the inflammatory products from other sources which are added to the urine.

Similarly the extension of inflammation from the bladder to the pelvis of the kidney is often accompanied by no increase in severity of the symptoms and no further alteration in the condition of the urine. The cells discharged from the pelvis of the kidney so closely resemble those of the mucous membrane of the bladder that no reliance can be placed upon their discovery as an indication of pyelitis. On the other hand, in typical cases, the presence of more fever and more severe constitutional symptoms than the bladder or urethral mischief will account for, would raise a suspicion of the affection of the higher portions of the tract. Other signs which may be present are a large discharge of pus in a but faintly ammoniacal urine, and tenderness in the loins. Further, it must be remembered that when these symptoms being present are nevertheless not well marked, the fact of the primary trouble having existed for some years renders it very probable that the kidneys are also affected. When the accumulation of pus has reached the stage of pyonephrosis (*q.v.*) the ordinary symptoms of that condition will be present.

Acute or sub-acute interstitial nephritis gives rise to a febrile temperature, sometimes only observed at night, and together with this there are emaciation, pallor or sallowness of the complexion and great and progressive weakness. Digestive troubles are marked. The tongue varies in its appearance; it may be clean or furred, dry or moist. Nausea and sometimes vomiting are noticed. Either obstinate constipation or diarrhoea may be found. The pulse is frequent and feeble. The urine gives no reliable indications, nor is there any acute pain or tenderness in the loins, although an aching or dragging sensation may be complained of.

When such symptoms come on acutely, with rigors or chills after the passage of an instrument or after some operation upon the bladder or urethra, little difficulty will be experienced in diagnosing the condition. On the other hand, as in

the chronic form, the disease may be insidious and incapable of recognition.

Acute suppurative nephritis gives rise to similar but more marked symptoms. Particularly it must be noticed that the temperature is much higher and subject to great variations. Rigors and sweatings are pronounced, and somnolence and torpor with muttering delirium may be observed in the later stages. The pupils may be either normal or contracted. Pain and tenderness in the region of the kidneys is often complained of.

Prognosis.—The prognosis of all the secondary forms of kidney disease is very grave. They increase greatly the danger of instrumental interference with the primary affection, and indeed no operation should be performed until an attempt has been made to alleviate the symptoms of interstitial nephritis, if these be present. At the same time, it must be stated that treatment adapted to allay irritation from the primary disease often leads to great diminution in severity of the secondary affection, and even to an apparent but temporary cure.

Treatment.—These secondary affections must be treated on the same lines as the same conditions when occurring primarily. The rules for such treatment will be found on reference to the articles on these various subjects. It will suffice here to say that the patient must be kept at complete rest, and on a light fluid diet, while quinine and opium are of use to allay the constitutional symptoms. Cystitis with decomposition and retention of the urine should be treated by washing out the bladder.

ROBERT MAGUIRE.

SWEAT GLANDS, DISEASES OF THE.—The diseases of the sweat glands are principally of functional origin, being due to an alteration either in the amount or in the nature of the fluid secreted. Anidrosis and hyperidrosis are the affections in which there is a quantitative change, bromidrosis, chromidrosis, and uridrosis those in which there is a qualitative change in the secretion.

Anidrosis.—A deficient excretion of sweat occurs in the early stage of febrile disorders, in diabetes and in Bright's disease; it is also found as a secondary phenomenon in various affections of the skin—*e.g.*, ichthyosis, scleroderma, anæsthetic leprosy, prurigo, eczema, and psoriasis. It may result from personal uncleanliness and the consequent accu-

mulation of effete epidermis blocking the sweat ducts. Occasionally also persons are found who never perspire, even after violent exertion on the hottest days, but who present no appreciable structural peculiarity of skin; such persons are usually of phlegmatic temperament, or in a high condition of "training," which appears to have a steady effect upon the peripheral circulation.

Treatment.—Turkish or vapour baths are generally useful, and the re-establishment of sweat secretion gives the greatest relief—*e.g.*, in chronic renal disease, scleroderma and ichthyosis. The undoubted utility of subcutaneous injections of pilocarpin (gr. $\frac{1}{10}$ – $\frac{1}{4}$) in severe prurigo with dense infiltrated patches of skin, is probably also the result of the gradual re-establishment of the sweat secretion.

Hyperidrosis.—A condition of excessive secretion from the sweat glands. It occurs in most diseases accompanied by pyrexia, especially in acute rheumatism and pyæmia; it is a striking feature in the third stage of ague and in the hectic of phthisis and rickets; it is also produced by the action of certain drugs especially pilocarpin, antipyrin, and the salicylates. In these cases the increased secretion is general all over the body and is purely a symptom, not a disease in itself. The sweat is usually normal in character or rather more watery than natural, and it is poured out freely on the surface of the skin. Sometimes, however, it does not escape so readily owing to blocking of the duct from swelling of the structures through which it passes; the sweat then accumulates under the superficial horny layers of the epidermis to form small, clear, transparent vesicles to which the names of *Sudamina vel Miliaria crystallina* have been applied.

Sudamina from their transparency have very much the appearance of drops of water on the skin, but, of course, cannot be wiped off. They are principally found on the neck, chest, back, and abdomen; they form rapidly, but when once formed do not increase in size, nor coalesce to form bullæ, but remain always discrete. In a few days the fluid is absorbed, the vesicle dries up, and there is slight desquamation of the epidermis over the part. In a certain number of cases the appearance of miliaria seems to be independent of excessive secretion of sweat. Sometimes the contents of the vesicles become cloudy, milky, or semi-puriform in character, a

condition to which the name *Miliaria alba* has been applied; it is especially likely to occur over regions to which poultices have been applied.

Inflammation may be set up in the tissues surrounding the sweat glands, secondary to the retention of sweat. This gives rise to some redness round the vesicles, accompanied by slight itching; the contents often become purulent; the eruption is very copious and thickly set so that the skin assumes a vivid red colour, hence the name of *Miliaria rubra* applied to the condition.

The Red Gum or *Strophulus* of infants is in reality a miliaria rubra, and generally results from too much wrapping up; it was previously described as a form of lichen and confused with lichen urticatus.

Prickly Heat (*Miliaria Papulosa* or *Lichen Tropicus*).—A disease which usually occurs among people in hot climates, but persons who have once been affected are liable to suffer from recurrences even in temperate climates, after long intervals and without the usual exciting cause. A condition of affairs exists opposite to that which obtains in miliaria rubra, in that the inflammation around the orifices of the ducts of the sweat glands is primary and gives rise to obstruction of these ducts and so to retention of their secretion, while in miliaria rubra the inflammation is secondary to the retention. The eruption appears suddenly on any portion of the body and usually over extensive areas, but affects especially the forehead and back; it is accompanied by violent itching and there is also profuse perspiration.

Local Hyperidrosis.—Besides the above general hyperidroses a state of excessive sweating sometimes occurs in which a limited portion of the body or certain definite, symmetrical areas are affected. This occurs under two conditions:—(1) as a symptomatic phenomenon associated with lesions or functional disturbances of the nervous system, and (2) as an apparently idiopathic condition. (a) The connection of the nervous system with the secretion of the sweat glands has been clearly demonstrated by physiological experiments. When the sympathetic is paralysed, or the sensory nerve is stimulated, or the vaso-motor nerves supplying a part are divided, profuse sweating occurs there, and it has been found that in certain cases of hemiplegia profuse sweating has occurred on the affected side, the determining factor of which has, however, not been ascer-

tained; the same has been observed in other cases—*e.g.*, a tumour of the meninges pressing on the spinal cord, division of nerves by injury, the sweating of one side of the face after parotid bubo pressing upon the facial nerve. Local hyperidrosis is an occasional sequela or concomitant of neuralgia affecting the fifth nerve or any of its branches. The writer has also observed a very interesting case in which violent sub-occipital neuralgia recurred every night for years, lasting about two hours, when a copious localized sweat broke out giving complete relief to the pain and allowing sleep. The patient had syphilitic disease of the bones of the base of the skull.

(b) In the other condition, without previous or concomitant symptoms, there is a constant or periodic hyperidrosis of certain definite parts of the body, the feet, hands, axillæ, groins, pubes and perinæum being the regions chiefly affected. The amount varies from a mere clammy moisture of the parts to a copious, continual dripping of sweat, and the subjects of the disease are often neurotic or alcoholic. The sweating produces soaking and maceration of the epidermis of the affected parts which becomes opaque and sodden, and soon peels off leaving a red, tender, weeping surface. A secondary eczematous condition often results especially when the hands, feet, and genital region are affected, and to this category belongs the disease described as Dysidrosis by Tilbury Fox. The affection is fairly common, especially among the lower classes, and is very chronic. It is said to be congenital and is sometimes hereditary, affecting various members of the same family.

Associated with this is the affection termed Bromidrosis; the connection between the two will be described later on.

Treatment.—For general hyperidrosis no special treatment is usually required. For the night sweats of phthisis, when excessive, atropine (gr. $\frac{1}{120}$ – $\frac{1}{60}$), picrotoxin (gr. $\frac{1}{60}$), arsenic, belladonna, strychnine and oxide of zinc, are specially useful drugs.

In the chronic local form of the disease great improvement can be effected by appropriate means. The clothing worn next to the skin ought to be made of flannel or wool, which absorbs the sweat. Various methods of medicinal treatment have been recommended—*e.g.*, belladonna, atropine, ergot, agaricin, bitter tonics with the mineral acids, &c., &c., while Crocker strongly recommends precipitated sulphur in drachm doses in

milk, twice daily. The parts may be washed with warm water and carefully dried, after which astringent lotions containing acetate of lead, alum, tannin or hazeline may be employed. More efficacious, however, is powdering the parts with finely divided boracic acid, which may, with advantage, be dusted over the feet and hands, and into the stockings, boots and gloves every day. Salicylic acid, 3 per cent., with starch and oxide of zinc or powdered talc is also most useful, but all these measures are merely temporary, and after discontinuing their use the condition is apt to recur. In such cases the following treatment recommended by Hebra is generally curative:—the feet are to be well washed and thoroughly dried; a dressing made of about equal parts of linseed oil and diachylon plaster melted together with 1 to 2 per cent. of salicylic acid and spread on linen, should be applied to the foot enveloping it entirely, pledgets being inserted between the toes. This dressing is to be removed after twelve hours, the foot rubbed with dry cloths and powdered with starch and the dressing re-applied. This must be repeated twice a day for a week or fortnight, when it will be found that the outer layer of epidermis will peel off, leaving a white surface, and the hyperidrosis will have permanently disappeared.

Preventive treatment is most important in persons liable to prickly heat; they ought to avoid excessive heat and chills, and should be careful to wear woollen clothes both night and day, instead of cotton or linen. The irritation can be relieved by lead, or lead and milk lotion, by calamine lotion (3j ad 5j), or by dusting powders of zinc oxide or salicylated starch.

Bromidrosis (Osmidrosis).—An affection in which the sweat has a disagreeable odour. The condition is generally, if not always, associated with chronic local hyperidrosis, especially of the feet; the subjects are very frequently female domestic servants, and the disease is peculiarly distressing as the odour is sickly, rancid and penetrating. In a few recorded cases, the odour has been considered agreeable, as of flowers—*e.g.*, roses, violets. A specific decomposition takes place in the sweat, due to the presence of demonstrable micrococci and bacteria (*bacterium fœtidum*) which, however, are always present in the macerated epidermis between the toes of uncleanly persons. The sweat, when first secreted, is inodorous, and prob-

ably a great part of the stench is due to the simultaneous decomposition of sebum and the formation of acids of the fatty series. The situations affected are those of hyperidrosis generally, and the treatment is similar, special value being attached to powdering with salicylic acid and starch. German soldiers, who appear to be very prone to the affection, are in the habit of rubbing suet containing 2 per cent. of salicylic acid into the feet night and morning. When the palms are affected, pure silicic acid (*terra silicea*) is even more effectual than salicylic acid.

Chromidrosis (*Coloured Sweat*) is of very rare occurrence, but authentic cases are on record of all the following:—

(a) *Black sweat* (*Seborrhœa vel Steatorrhœa nigricans*) occurs usually in hysterical girls, the part affected being the face, generally above the eyelids; the affection is usually symmetrical. It is certainly frequently associated with chronic constipation, which probably stands in causal connection to it, indican being excreted by the sweat and sebaceous glands, and becoming oxidized to give rise to the dark colour. The amount of pigmentation varies from day to day, and is generally worst before a menstrual period. It forms a deposit on the skin which is washed off with great difficulty, unless ether or chloroform be used. The condition is sometimes simulated by hysterical or designing women.

(b) *Blue or green sweat* is sometimes seen in copper workers; it has also been attributed to taking large doses of iron medicinally.

(c) *Red sweat or hæmatidrosis* may be due either to a micro-organism causing decomposition of the sweat after its secretion, in which case it occurs especially in the axillæ and genital region, or it may be due to an exudation of blood into the sweat gland. This latter condition sometimes occurs in hysterical persons.

Uridrosis, or the excretion of urea in large quantities in the sweat, is observed in cholera, atrophy of the kidneys and uræmia, when the renal functions are in abeyance. The sweat assumes a distinctly urinous odour, and the urea reactions in it are easily obtained.

J. J. PRINGLE.

SYCOSIS (*Folliculitis Barbæ*; *Sycosis Non-parasitica*).—An inflammation of the hair follicles and peri-follicular tissue, usually chronic, characterized by the presence of pustules, tu-

bercles, and occasionally dermic abscesses or fungating excrescences, accompanied by tenderness or burning sensations, and sometimes resulting in scarring and permanent loss of hair. The disease is almost exclusively confined to the male sex, and affects chiefly the hairs of the moustache, beard, and whiskers; it occurs between the ages of twenty and fifty, and, if not treated, may persist for years. An absolutely identical process, to which the name of *Folliculitis* is attached, may affect the hairs of the scalp, axillæ and pubes, either primarily or as a sequela of eczema in these situations.

Eruption.—The appearance presented by true non-parasitic sycosis is subject to great variation according to the duration, acuteness or chronicity of the affection, but pustules perforated at their apex by a hair are invariably present. The moustache is frequently the original site of the disease. The hairs in the earlier stages are firmly attached, and their extraction is painful, but afterwards they lie loosely in the disorganized and patulous follicles, and are easily extracted without pain. In either case they exhibit no fungus under the microscope, but are swollen down to the root from serous infiltration, and the inner root-sheath, which is often detached along with them, may be mistaken for a fungus. Serum, pus, or sanguineous fluid oozes out along the hair shafts or is poured out from the distended follicles after the hairs have fallen or been removed, and the discharges collecting among the neighbouring hairs dry up to form yellow crusts. The progress of the inflammatory process in the peri-follicular tissue (which appears generally to be primarily involved) leads to the formation of large, indurated, prominent tubercles, practically identical with the condition of the scalp known as *kerion*; these, however, are a more prominent feature of parasitic sycosis (*Tinea Barbæ*); from their inflammatory destruction fungoid excrescences or dermic abscesses are formed, the healing of which is accompanied by cicatrization. The scars are frequently the starting-point of cheloid formation. Relapses are common, and persistent treatment is indicated even after apparent recovery.

Ætiology.—The disease affects all classes, and persons who shave as well as those who do not; personal uncleanness is, nevertheless, undoubtedly a predisposing cause. A large proportion of its victims are in poor general health or

suffer from overwork. A specially severe form is sometimes communicated from cattle to man. The immediate causative agent is not known; some attribute the disease to the irritation produced by the growth of a young hair into a follicle before the old hair has fallen, or to excessive size of the hair-shaft; irritant cosmetic applications, blunt razors, &c., may produce it. There is good reason to believe that the exuded pus is infective, suggesting the possibility of a specific micro-organism. The use of the microscope is in all cases necessary to establish a certain diagnosis, especially to distinguish it from tinea barbæ. It may also be confounded with acne, eczema, lupus, and pustular syphiloderma.

Treatment.—Constitutional treatment is often beneficial, iron, quinine, strychnine, arsenic and cod-liver oil being the remedies most generally indicated. In some cases the perchloride of mercury appears to be very serviceable and Donovan's solution has been specially advocated.

(2) *Local.*—The hair must be cut short or very carefully shaved with a sharp razor every day or two. All crusts must be removed by poultices or oil; if the process be very acute and painful, soothing tepid lead lotions ought to be applied. If more chronic, epilation is certainly the best means of cure; the skin having been steamed or bathed in hot water, epilation of the loose hairs only ought to be effected with forceps, each hair being seized separately; a small area ought to be epilated daily, mild mercurial or sulphur ointments being smeared on afterwards, and applied on strips of lint during the night. In the latest stages Unna's zinc-ichthyol salve-muslin is very useful. After recovery, great personal cleanliness must be enjoined.

J. J. PRINGLE.

SYMPATHETIC SYSTEM, AFFECTIONS OF.—It is necessary to consider separately the affections of the sympathetic nerves and of the sympathetic ganglia.

SYMPATHETIC NERVES.—A. **Cervical Sympathetic Nerve.**—Many attempts have been made to stimulate this nerve in the human subject during life by placing one electrode over it, usually just beneath the lobule of the ear, and the other on some indifferent point. The nerve is so deep that by the time the current reaches it, it must have diffused through so many important structures

that it is impossible to be sure that the results which follow its passage are due to its influence upon the nerve. We are therefore, in our study of the cervical sympathetic nerve in man, confined to those cases in which it has been damaged by wounds, tumours, abscesses, or aneurysms. It will be convenient to take the functions attributed by physiologists to this nerve, and to see how each of them is affected in man by disease or injury of it.

(1) The cervical sympathetic nerve contains fibres whose section causes *dilatation of the vessels of the head and neck* on the same side, and whose stimulation causes them to contract. Many cases prove that when in man the sympathetic in the neck has been destroyed from any cause, the affected side of the head shows well-marked dilatation of the blood-vessels which derive their nerve-supply from the nerve above its point of destruction. No observations have yet been made in man which prove that the vessels of the brain are dilated. The retinal and conjunctival vessels, as a rule, are normal, although in some of the lower animals they are dilated after section of the cervical sympathetic. It must be remembered that there are many individual differences in different animals in the distribution of the sympathetic nerves, probably in some the whole of the intra-cranial contents receive their sympathetic supply from the nerves which accompany the vertebral arteries. In man, as in rabbits and cats, the vascular enlargement may last for years. If a tumour irritates the nerve the vessels contract.

(2) There has been a *rise of temperature* on the affected side after destruction of the sympathetic in the neck in all cases in which it has been carefully taken. For example, in one case it was 36.7° C. in the ear on the affected side, and 35.8° C. in the ear on the other side. In one patient in whom the nerve was supposed to be irritated the temperature was lower on the affected side.

(3) *The Pupil.*—All the recorded cases show that in man as in the lower animals if the sympathetic in the neck be destroyed the pupil on the same side contracts, if the nerve be irritated it dilates. The contracted pupil reacts to light, to accommodation, to atropine, and to eserine. Contraction of the pupil is the most constant symptom of destruction of the sympathetic nerve both in man and in the lower animals. It remains contracted for years. As the

sympathetic fibres for the pupil leave the spinal cord chiefly by the second thoracic nerve, affections of the roots of the spinal nerves in this region as, for example, occur in spinal pachymeningitis and in certain cases of aneurysm, cause contraction of the pupil, and as the pupillary sympathetic fibres pass down in the cord from the brain to the second thoracic nerve, it follows that disease of the cervical spinal cord will, if it destroy these fibres, cause contraction of the pupil. Irritation of the cervical sympathetic causes dilatation of the pupil.

(4) *Retraction of the Eyeball* is in the lower animals often observed to follow destruction of the sympathetic nerve, and it has also been seen in some cases in man. In the lower animals it is apparently due to paralysis of the orbitalis muscle of Müller, but in man this is so imperfectly developed that it is difficult to believe that it can have any functional activity. In one case of irritation of the cervical sympathetic the eyeball protruded.

(5) *Narrowing of the palpebral aperture* follows upon destruction of the cervical sympathetic in about 80 per cent. of the cases. It is almost always observed after experimental division in the lower animals. The narrowing is due to an affection of the smooth muscles of the lid, its striped muscles are unaffected. Irritation of the sympathetic in the neck has been known to cause a widening of the opening.

(6) *The Secretion of Sweat*.—In the lower animals a diminution of the secretion is observed on the same side of the head and neck as that on which the nerve was divided. In man the evidence on this point is conflicting. In the majority of cases the secretion is diminished on the side of destruction of the nerve, but in a few it is increased. At present we cannot explain these differences.

(7) *The Secretion of Saliva*.—In the lower animals there is usually a diminution on the side of destruction of the nerve, in man sometimes there is a diminution, sometimes an increase. The reason for these differences is unknown.

(8) *The Lachrymal Secretion*.—In the lower animals this secretion has been observed to be deficient on the side of section of the nerve, and the same result has been noticed in two cases in man.

(9) *Trophic Changes*.—In young animals, if the cervical sympathetic nerve be divided, there is often slight hypertrophy upon the affected side, and also

an increased growth of hair. In man, four cases are on record, in which, after injury of the nerve, there was slight facial hemiatrophy; the bones and hair were not affected. It will be observed that these changes are just the reverse of those which occur in the lower animals. The cause of this difference is not clear.

No other symptoms than these nine are known to be due to extrinsic lesions of the cervical sympathetic nerves in man, except that occasionally, if the nerve be destroyed, there is slight internal strabismus, because the external rectus is to a small extent supplied by the cervical sympathetic.

The order in which the commoner symptoms appear after destruction of the nerve is usually the following:—Contraction of the pupil, narrowing of the palpebral fissure, vascular dilatation, rise of temperature, and alteration in the secretion of sweat.

Wagner stimulated the cut sympathetic in the head of a decapitated criminal, and obtained dilatation of the pupil.

Migraine, exophthalmic goitre, angina pectoris and facial hemiatrophy have all been attributed to intrinsic disease of the cervical sympathetic nerve, but this nerve has never been shown to be diseased in these maladies, and there is no doubt that the theories which attribute them to disease of it are incorrect. We do not know of any intrinsic lesions of the cervical sympathetic.

B. Vaso-motor Nerves.—Many diseases, such as Raynaud's disease, have been speculatively attributed to disease of the sympathetic vaso-motor nerves in different parts of the body, but there is not sufficient evidence in any case for the theory to be worth discussion. In peripheral neuritis, however, the vascular and trophic changes sometimes observed are no doubt due to affection of vaso-motor fibres which form part of the nerve which happens to be inflamed (*see TROPHIC NERVES*). Fagge ("Medicine," vol. i. p. 1002, second edit.) has recorded a case in which a growth involving the nerve-roots at the upper part of the thorax caused vaso-motor changes in the fingers, due no doubt to implication of sympathetic vaso-motor fibres. Dr. Sharkey has recorded a case in which alcoholic neurosis of the vagus caused acceleration of the heart (*see also Splanchnics*).

C. Splanchnics.—There are very few cases on record in which these were diseased. In one published by Dr. Wilks

injury to them was followed by paralytic distension of the stomach, and the writer has recorded a case in the *Pathological Transactions* (vol. xxxvi. p. 67) in which diabetes was associated with neuritis of the splanchnics. This is possibly the explanation of some cases of diabetes, for the splanchnics are the vaso-motor nerves of the liver, and irritation of them will lead to dilatation of the hepatic vessels, a condition which in the lower animals at least is followed by glycosuria.

SYMPATHETIC GANGLIA.—Many authors have described as extrinsic lesions of these bodies œdema, hyperæmia, accumulation of fat and hypertrophy. There is, however, no doubt that these descriptions are based upon errors of observation. The only extrinsic lesions of the sympathetic ganglia that are known are their invasion by neighbouring malignant growths. The writer has examined two cases in which the semilunar ganglia were involved in cancer of the pancreas. In both of them it was interesting to see how the cancer cells grew along and replaced the nerve fibres in the ganglion, so that in section masses of cancer cells could be seen surrounded by the hard fibrous tissue of the ganglion. This mode of growth was probably due to the fact that the nerve fibres offered least resistance. We know of no symptoms which can with certainty be ascribed to destruction of sympathetic ganglia. No conclusions should be drawn from the size of the larger sympathetic ganglia, for even in healthy subjects they vary more in size than do any other organs in the body.

Many diseases have been attributed to intrinsic lesions of the sympathetic ganglia, but those authors who have done so have failed to remember that in the human adult it is normal for the cells of the superior cervical and semilunar ganglia to be small, granular and pigmented. It is probable that the larger sympathetic ganglia in man are functionless, being like the appendix cæci, remnants of organs which in the lower animals have some function. The reasons for this statement are that in human fœtuses and in animals lower in the scale than man the cells are well formed, typical nerve cells, not atrophic, as in man; that the size of the larger ganglia is in human fœtuses, and in most species of lower animals constant, but in adult man it is very inconstant; and, lastly, that in man destruction of the ganglia by disease produces no symptoms

which can be referred to the loss of the ganglion.

The following diseases have been attributed to lesions of the sympathetic ganglia:—

Diabetes.—The changes which have been described in the semilunar ganglia in this disease are pigmentary atrophy of the cells and an increase of the connective tissue; but both these conditions may frequently be met with in patients who have not had diabetes.

Addison's Disease.—The medullary part of the supra-renal capsules is derived from the sympathetic system. Probably it is, like the larger sympathetic ganglia, functionless in adult man, for it is often small in proportion to the size of the whole organ, and even shortly after death is frequently found broken down, while in fœtuses and the lower animals it is larger in proportion to the whole organ and is firm and hard. It is extremely likely that the change often found in the supra-renals in Addison's disease is not the cause, but only a very frequent symptom, of the malady. Congenital absence, cancer and lardaceous disease of the supra-renals in man, and their extirpation in the lower animals do not produce Addison's disease. Occasionally the characteristic change may be found in the capsules without any other symptoms of Addison's disease; and lastly, sometimes the other symptoms of Addison's disease are found, and the characteristic change in the capsules is wanting, for they are only atrophied. These considerations have led some pathologists to believe that disease of the semilunar ganglia is the cause of Addison's disease, but this view is probably incorrect, for extirpation and cancer of the semilunar ganglia does not give rise to Addison's disease. Many of the cases which have been urged in support of this view have been unaccompanied by any microscopical examination of the ganglia and their nerves. Those which have been examined microscopically have only shown changes common in many persons who have had no symptoms of Addison's disease, and lastly, it is probable that in adult man the semilunar ganglia are functionless. We are in fact completely in the dark as to the cause of Addison's disease.

Exophthalmic Goitre.—The view used to be held that this malady depended upon disease of the superior cervical ganglion, but it is now discarded because physiology gives no support to the supposition that the superior cervical

ganglion can influence the heart or thyroid, and because the changes in the ganglion observed in exophthalmic goitre can frequently be found in other diseases.

Myxœdema.—In this disease the connective tissue of the sympathetic ganglia shows the same sodden appearance that it presents elsewhere.

The sympathetic ganglia have been said to be diseased in chronic Bright's disease, epilepsy, acromegaly, progressive muscular atrophy, tabes dorsalis, general paralysis of the insane, lead-poisoning, and syphilis, but all these statements are based upon faulty observation.

Numbers of maladies have been ascribed to functional disease of the sympathetic ganglia and nerves, but in no case is there any sound justification for such an hypothesis.

We have no knowledge that the smaller sympathetic ganglia are ever diseased in man.

In the *Guy's Hospital Reports* (vol. xlv.) and the *Journal of Physiology* (vols. viii. and x.) will be found articles by the writer in which the views of the functions of the sympathetic nerves and ganglia here given are described at greater length.

W. HALE WHITE.

SYNCOPE (Faintness).—A sudden loss of consciousness and motor power due to cardiac failure.

Symptoms.—The onset is more or less sudden (where heart disease exists it may be very sudden), the person turns pale, becomes giddy, and, if not seated, staggers. The skin is pale and clammy; the pupils are dilated and the eyes closed; the pulse is weak, frequent and irregular; the heart sounds are very weak and the respiratory movements are imperceptible; there may be vomiting, then complete unconsciousness follows, and the patient falls to the ground. From this state after a variable time the patient gradually recovers, slight sighing or movements of the limbs being often the first sign; colour then returns to the lips and warmth to the hands. As a rule, an attack does not last more than a minute or even less; but in cases of organic disease the duration may be considerable. When due to loss of blood there are sometimes general convulsions. A relapse, when it occurs, suggests that hysterical tendencies are present.

Ætiology.—Syncope may be due to organic disease of the muscular substance of the heart, but on the whole, it more often occurs apart from that

condition. Either the nutrition of the ventricular walls, or the nervous mechanism of the heart may be at fault, or owing to hæmorrhage an insufficient quantity of blood may reach its cavities. Amongst the exciting causes, apart from organic disease, exhaustion plays a prominent part, induced it may be by hunger, by breathing a vitiated atmosphere, by exposure to excessive heat or by wearing tightly fitting clothes. Sudden emotion, especially fear, is often the cause, while an unpleasant sight or smell or even a sudden sound will cause syncope in some individuals.

Treatment.—If the person be seen at the commencement of the attack, and if there be no cardiac disease, loss of consciousness may generally be prevented by making him sit down and stoop forward with his head between his knees, the feeling of faintness will soon pass off, and fresh air and a glass of water will complete the cure. When actual fainting has occurred the patient should be placed flat on his back and the clothes about the neck, chest and abdomen loosened, the windows should be opened and every means taken to secure a free access of air. In most cases spontaneous recovery will take place, but this may be aided by the administration of a little alcohol or sal volatile in water, or by the use of smelling salts. Should these measures fail, 5 to 15 minims of ether in water may be injected subcutaneously. Artificial respiration, galvanization of the phrenic nerves, and, in desperate cases, transfusion, may be resorted to.

SYPHILIS.—Syphilis belongs to a group of diseases which has increased in interest and importance since the relation of micro-organisms to certain morbid process has been properly recognized. This group, termed infective granulomata, comprises, besides syphilis, such diseases as tuberculosis, glanders, leprosy, actinomycosis, and the like.

Syphilis, in its clinical and histological features, is a typical example of the group. It is due to the introduction into the body of a virus from another individual, all the diseases of this group being inoculable or infective. The place of inoculation in syphilis becomes the seat of tissue-change, and then the poison spreads throughout the body. After a period varying within certain well-known limits, the skin and mucous membrane exhibit characteristic lesions, and after a variable time, swellings, resembling in structure granulation-tissue, form in the

various organs of the body. It is usual to divide the course of syphilis into three stages, primary, secondary and tertiary.

Primary Stage.—This varies in duration from six weeks to three months: it dates from the appearance of the initial sore, or chancre, until the advent of the constitutional symptoms which indicate the commencement of the secondary stage.

The *primary sore* or *chancre* appears from three to five weeks after inoculation as an excoriation, pimple or vesicle. This may increase in size and remain as a hard spherical dusky red pimple, but in the majority of cases it gradually enlarges and the centre breaks down, leaving a circular ulcer, the base and sides of which are hard and gristly to the touch. Sometimes the ulcer is at first soft, the induration ensuing subsequently. Under the microscope these indurated sores appear as an infiltration of small cells into the connective tissue. Gradually larger cells make their appearance and occasionally giant cells are seen. The greater part of this tissue breaks down, a part resolves and the remainder becomes converted into cicatricial tissue which persists and indicates the situation of the original lesion. As syphilis is most commonly contracted during sexual congress, the most frequent place for chancres is on the external genitals of both sexes, but indurated chancres may occur in such situations as the lips, cheeks, tongue, nipple, eyelid and finger. These are known as *erratic chancres*, and they often remained unrecognized until the appearance of the secondary rash unmistakably discloses their true meaning.

Soon after the appearance of a chancre the adjacent lymph-glands enlarge. In the case of the genitals it will be the oblique inguinal set, often on both sides; for the hand, the epitrochlear gland; for the mamma, the axillary set; for the lips and tongue, the sub-maxillary; for the eyelid, the pre-auricular glands. This enlargement and induration of lymph-glands may subside as the chancre heals; often they persist much longer and even remain obdurate in spite of treatment.

Secondary Stage.—This may commence at a period varying from six to twelve weeks after the initial sore. It is ushered in by a roseolous rash in typical cases, accompanied by a slight rise of temperature and a sore throat. As the roseola fades a papular or pustular eruption appears which may mimic almost

every known form of skin eruption. The spots are fairly symmetrical, cause little local discomfort, tend to disappear in the course of a few weeks, generally exhibit a coppery hue, and leave a pigmented stain after the papule has disappeared. The eruption on the mucous membrane takes the form of smooth raised circumscribed patches, mucous plaques; these are best seen on the tongue, near the tip, the soft palate, tonsils and lips, the margins of the anus, and on the labia of women. These mucous plaques are due to inflammatory change and infiltration of the upper layer of the corium and epithelium. Often raised patches, resembling mucous plaques, are seen in the soft skin between the toes.

Some weeks after the skin rash has appeared more serious lesions may become manifest, such as iritis, periostitis, without the formation of nodes, and painful affections of joints and tendon sheaths, frequently mistaken for rheumatism. At this stage the hair may fall (alopecia) and inflammation may affect the margins of the nail (syphilitic onychia). Epididymitis is an occasional complication and coincident with such symptoms, the general health suffers and anæmia supervenes.

During the course of the next few years, that is between the manifestations of the early secondary symptoms and the more typical lesions peculiar to the third stage, a syphilitic patient may be troubled with such affections as inflammation of the skin of the palms and soles (palmar and plantar psoriasis), a peculiar form of choroiditis, inflammation of the internal coats of arteries (syphilitic endarteritis), especially those of the cerebrum, white patches upon the tongue (leucoplakia), gyrate unsymmetrical rashes on the skin, especially on the forehead (corona veneris), and occasionally an acute form of laryngitis. These are sometimes referred to as late secondaries, or the *intermediate* symptoms.

Tertiary Stage.—Although the lesions of the third stage are characteristic enough, they begin at no definite period like the secondaries; they may appear four or five years after the initial sore or be delayed for ten, fifteen, or even twenty years. This stage is characterized by the formation of circumscribed patches of morbid tissue like granulations, in the organs, and known as *gummata*. A gumma is a very unstable body, it is somewhat spherical in shape, and in the early stage soft and gummy, hence the name. Often it undergoes absorption

and gives rise to no trouble. As it is poorly supplied with blood-vessels the central parts break down or caseate. The cells may become converted into scar tissue, the gumma then contracts, and a cicatrix forms. When seated in or near the surface of skin or mucous membrane gummata exhibit a strong tendency to soften and ulcerate, especially if irritated. A gumma may occur in any organ; lung, liver, spleen, kidney, brain, heart, testes, muscles, supra-renal capsules, in periosteum, where it is often called a node, and in connection with the dura mater and skin. Often the formation of a gumma is determined by injury. In a case known to the writer a gumma formed beside a small hydatid cyst in the liver. A blow or crush of the testis may be followed by the formation of a gumma in the organ; a blow on bone, which, under ordinary circumstances, would be of no moment, produces a node; an irritant tooth induces a gumma in the tongue; a strain of the biceps or rectus may be followed by an intramuscular gumma.

Gummata vary considerably in size. Usually they are noticed when of the size of a ripe cherry. In viscera they attain the dimensions of walnuts or Tangerine oranges, but visceral gummata rarely break down. When of large size in connection with joints and periosteum there is little doubt that they are frequently confused with sarcomata, a mistake of obvious disadvantage to the patient.

Pathology.—As stated at the commencement of this article, the clinical and morbid anatomy of syphilis indicate emphatically that it is identical with those diseases known to be due to the entrance and multiplication in the system of pathogenic organisms. As yet no one has succeeded in isolating the syphilitic virus, and no positive facts are forthcoming as to whether it is due to a micro-organism or a chemical poison. Micro-organisms have been detected in syphilitic lesions, but they have not fulfilled the conditions necessary to establish the fact that they are the cause of this disease, that is, they should be constantly present in the lesions; secondly, they require to be cultivated in media apart from the body, and, lastly, when the products of pure cultivation are introduced into an animal they should produce the lesions peculiar to the disease. So far as syphilis is concerned, these conditions have not been fulfilled; this may in part be owing to the remarkable fact that syphilis, so far as our present

knowledge goes, is a disease peculiar to human beings. No one has detected syphilitic lesions in the lower animals, nor satisfactorily produced "complete" syphilis by direct inoculation even in monkeys.

Treatment.—Two drugs are specific for this disease, mercury and several of its salts, and iodide of potassium. It is impossible to give modes of treatment for every case that comes before the practitioner, but it is important to bear in mind that the primary stage requires mercury, and this is easily administered in the form of blue pill or grey powder. The induration of the chancre and glands rapidly disappear during its administration. When the secondary rashes appear iodide of potassium must be given as an *adjuvant* to the mercury. The latter drug should be exhibited for at least a year, the dose being varied according to the constitution of the patient and the practitioner's experience of the case. Even in the anæmia of syphilis mercury acts as a tonic, but in the tertiary stage its effects are often detrimental, then iodide of potassium is usually a most potent drug. In this stage it is well to begin with small doses gradually increased, for patients rapidly acquire a toleration of iodide of potassium.

Minor, but distressing, troubles arising in the course of the disease, such as the sores on the lips, mouth, throat, anus, &c., require special applications and modes of treatment apart from the general therapeutics of syphilis and are considered elsewhere (*see* SYPHILITIC AFFECTIONS OF THE SKIN; *also* SYPHILIS, CONGENITAL).

J. BLAND SUTTON.

SYPHILIS, CONGENITAL.—The variations in the clinical characters of inherited syphilis are very numerous and may be of every possible kind. In practice certain combinations of symptoms are of frequent occurrence and others are rare. No proposition is more true than that inherited syphilis may exert an influence on the nutrition and function of every tissue in the body; at the same time some tissues are much more prone to be affected than others. To draw hard-and-fast distinctions between hereditary and acquired syphilis is warranted neither by clinical nor pathological observations. It is unnecessary here to discuss Colles's law, which states that the mother never having shown signs of syphilization may yet suckle her syphilitic child without herself being tainted.

Syphilitic semen appears to be the commonest source of a syphilitic child, the ovum of the mother being tainted but the rest of her organism frequently escaping.

Hereditary syphilis, rickets, and improper feeding are the most potent causes of disease during the first months of life, and there is often adequate proof of the influence of each of them having been in operation in the same infant. This very mixture of causes is a fruitful source of difficulty in diagnosis. Syphilis may cause lesions and death of the fœtus and of the newly born as well as of infants of all ages. Miscarriages, premature births and still-births are its familiar consequences.

Early Manifestations of Congenital Syphilis.—The commonest manifestations after birth are inflammatory changes and their consequences about the junctions of the mucous membrane with the skin. The eruption about the nates in syphilitic infants differs from that produced by the napkin, in its coppery tint and in not being strictly limited to the region covered by the napkin, but spreading down the calves and legs. Some believe that syphilis may cause an eruption indistinguishable from one due to indigestion or other form of irritation, except in that it disappears when mercury is administered. The nature of the syphilitic lesion varies widely. There may be redness and infiltration with slight desquamation of the skin, or a weeping surface, or a more squamous area; tubercular infiltrations, coppery maculæ and roseola are also met with.

An inflammation of the nose, rhinitis, is commonly present, and may proceed to ulceration and caries, with the result of bringing down the bridge of the nose to a varying extent. In the early stages the coryza of rhinitis causes the familiar "snuffles."

Pemphigus neonatorum is rare, and generally appears during the first days of life; large bullæ arise on the buttocks, palms, soles, and even elsewhere; they are generally flaccid, and contain a seropurulent fluid; the disease is frequently fatal; some cases are probably not syphilitic; in two fatal cases the writer found no syphilitic or other internal lesions.

Other early manifestations are—Infiltration, redness and desquamation of the soles, and sometimes of the palms; pigmented areas on which blebs or bullæ may arise; crusts and scabs resulting from bullæ, and red raised scaly patches

spreading in rings, differing very little from ringworm in external appearance. There may be a very general infiltration of the skin, which may feel tough and suggest scleroma, or tough and dry, reminding one of parchment or wash-leather. The finger- and toe-nails are sometimes cylindrical and stained as if with picric acid; the palms and soles may show a similar staining; there may be hard swellings of the testicles with or without hydrocele; the tongue may present "wash-leathery" looking patches, serpiginous ulcerations and gummata; the so-called superficial migrating glossitis (mapped or geographical tongue) is not always syphilitic; ulcers may appear in the mouth, with diffuse stomatitis and gingivitis, leading rarely to alveolar necrosis. Subcutaneous tubercles, differing from scrofulous indurations in being more numerous, more prone to suppuration and to bleed freely when opened; condylomata, more often found after the seventh month than before, and not accompanied by other cutaneous lesions and craniotabes of the occipital and postero-parietal region, constitute other evidences of the condition. A hoarse cry from laryngeal disease, diffuse catarrh, mucous tubercles, or general hyperplasia and ulceration may appear.

Syphilitic pseudo-paralysis of the limbs, due to inflammatory disease at the junction of the shaft and epiphysis in the most growing area, is characterized by immobility, tenderness, and symmetry. The faradic irritability of the nerves is not impaired, the knee- and elbow-jerks are not lost; indeed the faradic, galvanic, and mechanical irritability of the nerve-muscle seem rather increased. The knee-jerk is not lost even when the epiphysis is separated from the shaft. The affection is very common about the knee-joints, elbow, and wrist, and is most frequently observed before the age of ten months; it may be mistaken for infantile scurvy, but the cachexia and tenderness are more marked—as a rule—in the latter affections, and the induration involves the shaft more than in the syphilitic disease. Cases of mixed scurvy, rickets, and syphilis are occasionally seen.

The Later Manifestations of Congenital Syphilis may occur at any period after two years of age; they are apt to appear at the beginning of the period of second dentition and at puberty.

The rhinitis may smoulder for a long time, and may appear to have died out and then may light up again. From this

may result bloody discharges and pharyngeal secretions, ulceration, sloughing, and, finally, scarring; the soft palate getting united more or less extensively to the back and sides of the throat. To distinguish this from scrofula is sometimes difficult. The soft palate and nasal septum may be perforated by ulceration. Ear disease of almost any kind may arise in connection with the disease of the nose and throat. Deafness may result from changes in the true internal ear, exudation taking place into the cochlea and semicircular canals. But the commonest signs of past congenital syphilis are to be looked for in the bones, teeth, cornea, and in radiating linear scars about the mouth, nose, and anus, involving the mucous and cutaneous surfaces. Occasionally within the oral and nasal circles a vein-like marking recalling that of leaves may be seen; this is really a furrowing, but the cuticle has not been thrown off; beneath the cuticle there has been syphilitic tissue which has been absorbed.

The protuberant frontal eminence may be the expression of a past syphilis, but true bossing is found around the site of the anterior fontanelle. It is doubtful whether pure syphilis delays or quickens the closure of the anterior fontanelle. A want of clearness in the complexion is often present; opacity of the cornea is very common; the cornea may be simply foggy or the opacity may equal that of white porcelain. The keratitis is of the well-known interstitial type, it is most frequent during second dentition, but may be seen as late as thirty years of age; females suffer more than males; the rate of its appearance and disappearance varies much, but one eye is usually affected before the other. Iritis without keratitis is a rare symptom. Diffuse disseminated choroiditis, resulting in irregular pigmentation and atrophy, is also due to inherited syphilis; the colour of the pigment may be rusty or coppery or black. The ulnæ, lower ends of humeri, clavicles, tibiæ and the calvaria should be examined for diffuse or nodose enlargement; in the tibiæ pains may be complained of but rarely in the other bones, unless, which is unlikely, the headaches are to be attributed to Parrot's bossing. Dome-shaped molars and notched and pegged upper central incisions of the second set are the most characteristic dental changes in syphilis; stunted teeth and wide spacing of the teeth are also observed. The bones, teeth and cornea are apt to be

affected at much the same time in the same patient but any variety and any combination may be noted.

Morbid Anatomy.—Bone changes in syphilitic fetuses are most manifest in the area of junction of the shaft and epiphysis, where growth is most active. Contrasted and compared with rickets the changes are of great interest. The calcified lamina on the shaft side of the proliferating cartilage is much thicker and more irregular than in health; the marrow itself is more fluid and vascular; a considerable formation of soft bony material appears beneath the periosteum: excessive calcification, periostitis, and endostitis of the fungating kind being, briefly, the most marked changes. The process may lead to the separation of the shaft from the epiphysis, with or without the formation of pus. Sometimes a thin shell of periosteal bone can be separated from the endosteal bone, much as a pea can be removed from its pod. The changes are the same or very like those which cause syphilitic pseudo-paralysis.

The lungs may present white hepatisation in the new-born—large tracts or even a whole lobe of a lung having a pale, smooth aspect, the section not being granular, the consistence generally increased and the microscope revealing a fibrous interstitial overgrowth with atrophy of the pulmonary vesicles; the same condition as results from atelectasis. Probably this hepatisation is always a sub-acute process, at any rate it is rare to find a markedly cellular non-fibrous specimen. Nodules resembling gummata occur in the liver, with or without perihepatitis and adhesion to the abdominal parietes. The spleen may be enlarged, its section being uniform in appearance, of a dark-red colour, its consistence firm, and its borders unusually notched or lobulated, as the result of inflammation of the capsule. The capsule is thickened and puckered, and sometimes adherent to the abdominal parietes; the colour of the thickened tissue may be opaque white or buff coloured. The heart muscle may be the seat of diffused syphilitic tissue—the colour of the affected areas being milky white—and rarely of caseous gummata. Interstitial nephritis has also been described. Typical arteritis, choroiditis, meningitis, gummata in the substance and on the membranes of the brain and cranial nerves and enlargement of lymphatic glands, have been found in post-mortem examinations of syphilitic

children. The brain may be atrophied and sclerosed, with or without meningitis, and arteritis. Lepto-meningitis infantum—posterior meningitis—is sometimes syphilitic (see paper by writer in *Path. Trans.* 1889 and *Brain*, 1883).

The thymus may be the seat of supuration, the pus being laudable or cheesy. Even lardaceous disease of the liver, kidneys, spleen, and intestines may arise.

Treatment.—Attention to the dietary and to other matters on which the general health depends may suffice to enable the child to overcome its syphilitic taint. The syphilitic child may be nursed by its mother. A cotton wool dress should be ordered if the infant is shrivelled and has the “old man” look. As such children are specially susceptible to the influence of bad air, bad food, and cold and damp, great attention must be given to all these particulars. Ulcers and fissures may heal without the aid of mercury, by simply keeping the parts clean and protected from every kind of irritation, including the atmosphere; but mercury promotes the soundness and increases the rate of the cure.

Hydrargyrum c. creta is the best mercurial preparation; it should be given in grain doses, three times a day. Should it appear to derange the intestines or stomach, which is seldom the case, bismuth or bicarbonate of soda may be given with it. In bad cases, rubbing blue ointment into the thin skin of the belly or armpits is the only mode which should be practised. The skin should be cleansed freely with soap and water before each inunction. Syphilitic meningitis, laryngitis and hepatitis (with or without ascites) should each be treated by local inunction of blue ointment. The head and neck should be shaved in the first-mentioned disease and the ointment freely rubbed into the skin of the back of the neck and into the shorn scalp. The enlarged spleen does not diminish to any appreciable extent under the use of mercury; probably the repeated and prolonged congestion has led to the overgrowth of fibrous tissue, and this form of fibroid overgrowth is not so easily removable as that which is the product of syphilis alone. Any antiseptic preparation is useful for skin and mucous lesions—*e.g.*, iodoform, calomel, boric acid; but rest, cleanliness and avoidance of irritation are of equal importance. Ozæna is best treated by sea air, local medication and good living. Cod-liver oil and syrup of the iodide of

iron are as useful in syphilis as in scrofula. If the chalk preparation cannot be borne the liquor hydrargyri perchloridi in half-drachm doses may be used.

ANGEL MONEY.

SYPHILITIC AFFECTIONS OF THE SKIN (Dermatosyphilis, Syphiloderma).—It is still usual to describe syphilodermata as “secondary,” “late secondary,” and “tertiary,” although there is no clinical or pathological justification for drawing so artificial a distinction. Certain characteristics are usually ascribed to early or “secondary” rashes, and although no single one among them is peculiar to syphilitic lesions—which differ in no sense morphologically from non-syphilitic—their *ensemble* constitutes, nevertheless, a striking picture which may with advantage be retained in the mind.

Characters of Early Syphilitic Eruptions.—(1) They are of reddish brown, coppery or raw ham-like colour, and leave pigment-stains; the transudation of blood-pigment upon which this depends is common to all rashes where there is blood stasis, especially in dependent parts.

(2) They exhibit marked symmetry—like the erythemata and many other groups.

(3) They frequently affect the forehead (corona veneris), the sides of the mouth and nose, the soles and palms, the flexor aspects of the limbs and the nape.

(4) They are polymorphous—*i.e.*, various types of eruption, or various grades or stages of evolution of the same type, are frequently present at the same time. Although not an exclusive appanage of syphilides the character is an important one: hence the necessity for the fullest possible exposure and examination of doubtful cases.

(5) They show a tendency to circular grouping—a minor point.

(6) They seldom itch or cause subjective symptoms except when markedly desquamative, or when irritating applications have produced secondary eczema.

(7) They develop slowly as compared with certain exanthematous rashes which most closely resemble them.

The so-called “tertiary” rashes are always ulcerative and result from the breaking down of gummata in the skin or subcutaneous tissue. Their general characteristics are:—

(1) They occur on any part of the body—as contrasted with simple ulcers—

which almost invariably are situated on the legs.

(2) They are unsymmetrically distributed, although not usually confined to one side of the body.

(3) They extend centrifugally by a raised, infiltrated edge while healing in the centre; horseshoe-shaped, kidney-shaped and serpiginous ulcers being thus formed.

(4) They affect the palms, soles and roots of the nails with great frequency.

(5) They form rapidly, and the pain accompanying them is usually less than that caused by the disease in the same situation which most closely resembles them (lupus).

(6) They leave flat white scars.

Kaposi points out that all syphilides possess these essential characteristics which serve to distinguish them from all other eruptions—viz., (a) they are always sharply defined, uniform, cellular infiltrations of the papillæ and corium, varying only in size; (b) these cells never organize forming permanent tissue, but are either absorbed or break down and pustulate; (c) the lesions always extend centrifugally, the oldest—i.e., central portion disappearing first.

For descriptive purposes the classification of Baümler may be adopted with slight modification.

Group I.—Circumscribed Hyperæmia of the Papillæ with slight Infiltration.—The macular or roseolous syphilide is usually the first symptom of syphilis which succeeds the primary sore and adenopathy, both of which it may occasionally precede. It generally occurs from six to twelve weeks after inoculation, or as a symptom of relapse within the first twelve months; in the former case its appearance is often heralded by a few days malaise and evening pyrexia, often considerable (103° F.), and is accompanied by symmetrical congestion and superficial ulceration of the tonsils. The rash consists of discrete, erythematous spots varying in size from a lentil to a finger-nail, the edges not well defined, at first of a bright pink colour obliterated by pressure, afterwards dull and pigmented, causing a "marbled" appearance, brought out well by exposure to cold. They last from a few days to two months, and do not desquamate. Generally they occur on the abdomen and flanks, then on the fronts of the arms, the back and sides of the neck; they are rare on the face and backs of the hands. Occasionally an undue amount of effusion may cause them to resemble

urticaria. Up to the end of the third year a form of erythematous rash, consisting of large, persistent ringed spots occasionally shows itself (roseola syphilitica annulata).

The disease must be differentiated from measles, rōtheln, urticaria, tinea versicolor, seborrhœa corporis, pityriasis maculata, and many medicinal rashes.

Group II.—Marked Infiltration of the Papillæ.—The large or lenticulo-papular syphilide is perhaps the commonest and most important syphiloderm. Smooth, shining, dusky red papules the size of a lentil, or larger, and at first circumscribed, develop in the flexures, on the front of the arms, forehead, back of the neck, borders of the scalp, in the groins, between the mammæ, round the mucous orifices, and in receding angles of the skin (e.g., alæ nasi). They do not suppurate, but after absorption leave atrophic depressions, at first pigmented, but afterwards brilliant white. Often one of the earliest syphilodermata, they may occur along with the macular syphilide and constitute the commonest relapse form during the first five or ten years. Their abundance is usually proportional to the earliness of the period at which they appear. In late relapses they tend to affect the angles of the mouth and the "web" of the toes, where they may cause painful and obstinate rhagades.

They may become (a) squamous, (b) moist, (c) circinate.

(a) The large papulo-squamous syphilide is characterized by the presence of scanty, thin, dirty-looking scales on a dull red papular base. The scale is the result of the shrinkage of the formerly tense epidermis after the absorption of the central portion of the papule. Its distribution has already been described. The condition frequently mis-called psoriasis palmaris et plantaris is the result of the development of this syphiloderm on the palms and soles, modified by the anatomical peculiarities of the parts, especially by the thickness and resistance of the epidermic layers. The papules are scarcely at all raised, and appear as dusky blotches over the centre of which fine scales may form; more frequently the epidermis splits and becomes opaque; sometimes minute perforations may occur, or the central portion, may be shed, leaving an irregular breach of surface with frayed, ragged edges and dusky red base. The condition affects the centre of the palm and ball of the thumb, and may extend to the wrist, where its raised spreading

edge is speedily recognizable, but it never affects the dorsum of the hands, and is not accompanied by pain, burning or itching. If it occur as a late manifestation, it is often one-sided and obstinate to treatment. It must be carefully differentiated from palmar eczema and psoriasis.

(b) *The moist papular syphilide, flat condyloma or mucous patch* is the result of the maceration and removal of epidermis from papules where subject to contact, friction, warmth, moisture and dirt; thus they occur about the anus, perineum, genitals, navel, armpits and in the flexures; their surface is covered with greyish detritus, and their secretion is very infective, usually producing condylomata rather than hard sores.

Mucous patches are the commonest starting-point of the condition known as syphilis eutanea vegetans vel frambesiformis, which consists in the rapid outgrowth of red, warty, cauliflower excrescences; these, although formidable in appearance, are very amenable to local treatment. They sometimes also originate from gummatous lesions.

(c) *The early circinate syphilide* is a very rare form, chiefly affecting the forehead, nose and chin; it probably begins as a papule, the centre of which is rapidly absorbed, leaving healthy looking skin, whilst the edge only persists as a delicate, thread-like ring. Several of these generally coalesce to form elaborate gyrate figures; they may be mistaken for tinea circinata.

Group III.—Marked Infiltration especially implicating the immediate vicinity of the Hair Follicles.—*The miliary, lichenoid, or small papular syphilide* is of comparatively infrequent occurrence. The papules vary from the size of a poppy-seed to that of a pin's head, are closely packed in groups or circles and each is pierced by a hair. They occasionally develop as an early relapse rash in cachectic individuals, when they affect the shoulders, arms, trunk and thighs; they are extremely obstinate to treatment. More frequently a few papules appear in late relapses about the mouth and eyes, and in the flexures.

(a) *The miliary papular syphilide* is the typical form just described; it often itches and heals, leaving deep atrophic scars, after copious desquamation; or it may develop into the two following forms. It closely resembles lichen ruber, lichen scrofulosorum, keratosis pilaris, or even psoriasis guttata.

(b) *The miliary vesicular or herpeticiform*

syphilide is a very rare syphiloderm, which occurs usually in successive crops on regions where the skin is thin, especially the face and genitals, in the first six months of the disease along with other manifestations. The vesicles may or may not be umbilicated, the fluid in them remains clear for many days and after its absorption, light grey crusts and minute umbilicated depressions are left.

(c) *The miliary acuminated pustular syphilide* is also derived from the miliary papular syphilide, and is commoner than the herpeticiform variety; a bead of pus forms at the apex of each papule, and after separation of the resulting crust, a minute, deeply pigmented scar is left.

(d) *The large acuminated pustular, or acneiform syphilide* is closely allied to the last form, but its base is more extensive, and deeper suppuration occurs; it follows closely upon inoculation, in association with other syphilodermata and tends to affect especially the scalp, face and trunk. It is commoner in negro than in white races, and its course is usually rapid and benign; it may closely resemble bromide or iodide rash. *The varicelliform or varioloid syphilide* is the highest grade of this syphiloderm. The vesicles are sometimes umbilicated, the pustules may be as large as a pea, the dusky halo round the base of each is marked, the pyrexia attending their development is high, the scars following their subsidence are deep and honeycombed.

Group IV.—Deep Infiltration with sub-epithelial Suppuration and superficial Ulceration.

(a) *The superficial ecthymatous syphilide* which begins as a flat papule soon forms a flat pustule and desiccates, forming a brown scab, which, when separated, leaves a flat cicatrix. It occurs most commonly on the back, shoulders and limbs from the sixth to the eighth month after inoculation.

(b) *The deep ecthymatous syphilide* is distinguished by the increase of suppuration and the deeper extension of the ulcerative process. It forms the basis of the form of syphiloderm known as *Rupia*, and characterized by the limpet shape, lamination and imbrication of its crusts, due to continuous formation from beneath. The condition is a somewhat rare one and occurs in cachectic individuals, either within the first twelve months of the disease or later; it requires special tonic treatment.

(c) *The bullous or pemphigoid syphilide* exhibits larger blebs and a less marked areola than the last form; it is seldom

present in other than congenital cases.

Group V.—*Gummatous Infiltration with Ulceration* may be either cutaneous or subcutaneous.

(a) *The tubercular or lupoid syphilide* is the result of infiltration of the papillæ and corium; the nodules are deep red, brownish or yellowish in colour, vary from the size of a pea to that of a bean, and are commonest on the face and back, usually grouped in circles or corymbose clusters. They never occur until at least two years after inoculation; they are very chronic and usually painless. They leave serpiginous scars; their differentiation from lupus is frequently a matter of extreme difficulty. The age of the patient, the duration of the disease, the rapidity of its extension, the characters of the scars, the presence of other syphilitic manifestations and the result of treatment will usually guide to a correct diagnosis.

(b) *Subcutaneous gummata* form the basis of the so-called "tertiary" ulcers already partially described. They are at first deeply situated, hard, elastic and frequently painful; they occur in small numbers and generally in regions where the tissues are lax,—e.g., flexor surfaces of limbs, abdomen, thorax; the resulting ulcers are sharply cut, "punched out" with undermined edges and uneven base covered with dirty-looking gummy deposit; they often cause necrosis of subjacent bones or cartilages.

Pigmentation in Syphilis is usually the result of antecedent roseolous, papular, pustular, or ulcerative lesions, but a special and independent form of pigmentary syphilide is comparatively common in young women and weakly lymphatic men with thin skins. This shows itself as brown spots or patches on otherwise healthy skin, from six to twelve months after inoculation; usually first on the back of the neck, to which it gives a "dappled" appearance, or on other exposed parts, from which it may gradually spread over the whole body. If slight it may only cause some "muddiness" of complexion; if severe the pigment is irregularly distributed, and the condition exactly resembles on the one hand leucoderma, on the other those diffuse forms of chloasma which accompany many cachectic diseases. It probably does not depend directly upon the syphilitic virus, and this view is borne out by the complete futility of anti-syphilitic treatment directed towards its removal. Leucodermatous patches independent of

antecedent pigmentary rashes have been occasionally observed, although their existence has been disputed, especially by German writers.

Alopecia in Syphilis.—Baldness frequently accompanies the various stages of syphilis. In the first three to six months it usually results from the development of erythematous or papular rashes on the scalp; the hair falls uniformly all over the scalp, and frequently also from the eyebrows and genitals; permanent baldness from this cause is very rare. Seborrhœa causing partial baldness is also common. Occasionally baldness appears to result from disordered innervation or cachexia, the scalp presenting a normal appearance. Late ulcerative lesions cause permanent baldness. Syphilitic infants are frequently quite bald.

Treatment.—Most English authorities approve the internal administration of mercurials as soon as the diagnosis of syphilis seems fairly established, without waiting for its confirmation by the appearance of roseola. The Vienna school condemns such treatment, and considers that although the "secondary" efflorescence may be thereby delayed, it is usually aggravated in intensity, and so altered in type as to become confusing to the medical attendant. No such difference of opinion exists as to the value of mercury after the appearance of rash. It may be administered by the mouth, by inunction, by fumigation, or by hypodermic injection. Grey powder and blue pill are the preparations usually given in the earlier stages internally, and preferably in small, oft-repeated doses. The liquor hydrargyri perchloridi, often advantageously combined with bark, and the green proto-iodide of mercury, are those most frequently used at a later period. It is necessary in every case to watch the effects of the drug with care, not only because individual susceptibility varies greatly, and even minute doses are occasionally not tolerated, but also because in non-susceptible individuals the dose ought to be cautiously increased up to a point just short of the establishment of its physiological effects. Meanwhile, any tendency to diarrhœa must be counteracted by combining the mercurial with opium or hyoscyamus. Quinine, iron, cod-liver oil, and other tonics are often imperatively indicated, and general hygiene is of the greatest importance. The diet ought to be simple, and alcoholic excess is specially harmful. Flannel clothing ought to be worn to guard

against chills. Particular attention must be paid to the condition of the mouth and gums; tartar ought to be removed, carious teeth extracted, a soft toothbrush used several times daily and astringent gargles and mouth-washes sedulously employed. Smoking ought to be prohibited. It is well to continue mild mercurial treatment for one year after the initial lesion, even if the skin lesions have been slight. Some think that the use of mercury in any form is contra-indicated by albuminuria, and it appears occasionally to cause phagedæna, when its discontinuance in favour of opium is desirable.

For inunction twenty grains of blue ointment or of a 5 per cent. oleate of mercury ointment with lanolin may be rubbed into the groins, axillæ, or popliteal spaces every night, the site being varied to avoid local irritation. This method is invaluable for children. For fumigation calomel is usually employed, twenty or thirty grains being evaporated over a spirit lamp, beneath a wicker-work chair on which the patient is seated naked, and covered with a blanket. Both inunction and fumigation sometimes suddenly produce severe salivation.

The subcutaneous injection of mercurials has hitherto not found much favour in England, although its action is rapid and effectual, and it does not interfere with the digestive functions. One-third of a grain of the perchloride dissolved in twenty minims of distilled water may be injected once, or at most twice, a week deeply into the gluteus maximus muscle. The tannate, albuminate, formate, and peptonate are also employed, their efficacy being apparently proportional to the slowness with which they are eliminated from the system.

The iodides of potassium and sodium have little or no influence on the earlier stages of the disease, but act with remarkable certainty and rapidity on

gummatous infiltrations and ulcers. They are frequently prescribed at first in combination with the perchloride of mercury, the compound decoction of sarsaparilla being a favourite vehicle. As individual susceptibility to their effects varies greatly, and small doses are often very efficacious, it is generally advisable to begin with such, and gradually increase the dose. In the earlier secondary stages the iodides have probably little curative influence, but they remove the insoluble albuminate of mercury from the tissues, and may then aggravate salivation and other symptoms of mercurialism. Occasionally iodides directly aggravate the severity, and modify the characters, of syphilitic eruptions; the simultaneous administration of arsenic frequently prevents this puzzling complication. Some obstinate old syphilides are much benefited by the vigorous eliminative treatment carried out at many spas—*e.g.*, Aix-le-Chapelle. The local treatment of syphilodermata, although of secondary importance to the constitutional, is often a very useful adjunct. Diluted white precipitate ointment is good for papulo-squamous lesions, especially about the face; condylomata ought to be frequently dressed with black wash or mild perchloride lotion, and subsequently dusted with some drying powder. Mercurial plaster and ointment are especially useful for localized patches of papules and tubercles; obstinate "lupoid" lesions are sometimes advantageously destroyed with the acid nitrate of mercury solution, while iodoform or iodol is invaluable for serpiginous ulcers. Congenital syphilodermata are best treated by grey powder internally, and the inunction of mercurial ointment into the palms, soles, and abdomen, or by dusting powders containing calomel— $\frac{5}{8}$ ad $\frac{5}{8}$ of starch powder.

J. J. PRINGLE.

T

TABES MESENTERICA (*Tabes, a wasting disease*).—An old-fashioned term for chronic wasting disease characterized by enlargement of the lymphatic glands of the mesentery. The majority of such cases are instances of tubercular disease of these glands (*see* LYMPHATIC SYSTEM, DISEASES OF); others of chronic adenitis, with perhaps caseous degeneration secondary to intestinal catarrh;

others of malignant disease, especially lymphadenoma. Strümpell defines it to be general tuberculosis of the abdominal organs. Hensch uses the term "*atrophia meseriaca*," by which he understands a more or less general tuberculosis chiefly concentrated in the abdomen, the mesenteric glands having been affected secondarily to the peritoneum or intestinal mucous membrane.

TÂCHE CÉRÉBRALE is the name given to the pink streak which, under certain circumstances, appears when the nail or any pointed instrument is drawn across the skin. It has but little clinical value except as an evidence of an irritable condition of the vaso-dilators throughout the body. It is frequently present in tubercular meningitis, but may be seen quite apart from any cerebral affection; for example, in Graves' disease and in enteric fever.

Another form of tâche, called the "white tâche," in which the vessels of the area irritated by the nail undergo contraction and remain empty, can be occasionally produced in the same manner, especially in typhoid fever.

TAPE-WORMS (Tænia).—The cestodes or tapeworms have an exceedingly small head and neck and a long flat white body, which widens out gradually. The body is divided transversely into a number of segments, called *proglottides*, joints or links. The head is provided with suckers, by means of which it is able to fasten itself on to the mucous membrane of the intestine. From the slender neck the segments are gradually produced, becoming more and more distinct as they get further from the head. Each develops a bi-sexual generative apparatus, with a uterus in the form of a central passage traversing its entire length, and giving off numerous branches at right angles. After impregnation, the uterus becomes filled with ova, and eventually the segment, when it is ripe, separates from the rest of the worm, and is expelled with the fæces. Each segment is capable, under favourable conditions of moisture and warmth, of maintaining a separate existence for a short period. It has been calculated that the segments require for their full development a period of about three months, and as fast as they are thrown off others are ripening to take their place, so that the worm, when it has once reached a state of maturity, probably remains much the same length. The proglottides may rupture and discharge their ova whilst still in the intestines, but they are usually passed entire, and spontaneous movements of contraction and extension may be observed in them whilst still alive. If the segments and their contained ova be swallowed by their proper intermediate host, the gastric juice dissolves the covering of the ova, and the embryos are set free. Each embryo is armed with minute spicules, by the aid of which it passes

through the coats of the stomach. It is then probably carried away by the blood, ultimately reaching the liver, or muscles or some other part of the body, where it establishes itself permanently. It then loses its spicules and becomes the *scolex*, having a head exactly like that of the mature worm with a neck terminating in a cyst, within which the head and neck are inverted. In this situation the scolex may die and be converted into a calcareous mass, but if not, and if the portion of the animal containing the living scolex be eaten, it will be liberated in the stomach, its sac will atrophy, and the scolex passing into the intestine will affix itself to the mucous membrane and develop into the complete tapeworm.

VARIETIES OF TAPE-WORMS.—Several species of tape-worm have been found in the human body, but only three need be mentioned here, viz.—(1) *Tænia Medio-canellata*; (2) *Tænia Solium*; (3) *Bothriocephalus Latus*, of these only the two former occur with sufficient frequency to merit description.

(1) *Tænia Medio-canellata*, the beef tape-worm. This worm is the one by far the most commonly met with, and may attain a length of twenty feet. The head has four hemispherical suckers, but no hooklets. The segments, which are very numerous, are at first wider than they are long, then almost square, and subsequently of greater length than width, the fully developed ones being sometimes an inch long and a quarter of an inch wide. The branches from the uterus are very numerous, and terminate in club-shaped extremities. The *tænia medio-canellata* inhabits the small intestine. In beef the scolices appear as minute whitish oval bodies about the size of a mustard seed; such beef is called "measly."

(2) *Tænia Solium*, the pork tape-worm. Specimens of this variety are extremely rare in museums in this country, although many are so labelled. The mature worm is not so long as the one just described; the head is smaller, with four hemispherical suckers, and presents at the summit a blunt papilla or proboscis with a double circle of about twenty-five hooks. The segments differ from those of *tænia medio-canellata* in that the uterus gives off fewer branches, which terminate in flat pouches. The hog is the host; the scolices appear in its flesh (measly pork) as oval, hard, whitish bodies about the size of a hemp-seed, and possess already the double circlet of hooks. This worm is also

occasionally met with in the human subject in its larval form, the *cysticercus celluloseæ*, affecting chiefly the eye and the brain (see BRAIN, TUMOURS OF).

SYMPTOMS.—The symptoms usually described as resulting from the presence of a tape-worm rarely form a sufficiently distinct clinical group to allow of the diagnosis being made until some of the segments are passed. Amongst the most common symptoms are itching about the mouth and anus, uncomfortable sensations in the abdomen, disordered appetite, colicky pains, pallor, a furred tongue, foul breath, headache, and tinnitus aurium. Various reflex neuroses may be due to this cause, and in some undoubted cases insanity has owed its origin to the presence of a tape-worm. Sometimes the worm gets rolled up, giving rise to constipation, and may even produce intestinal obstruction. The symptoms are relieved when the worm is expelled.

TREATMENT.—The treatment of a case of tape-worm requires considerable care and attention to details to ensure a successful result. This is proved by the fact that it is by no means uncommon to meet with cases in which five or six separate attempts to dislodge the worm have ended in failure. The patient should go to bed and remain there until the treatment is over, for, if allowed to take exercise, he will be unable to undergo the prolonged fast which is an essential preliminary to the administration of the vermicide. The period of fasting usually recommended—viz., twenty-four hours—is quite inadequate to clear the intestines of their fecal contents. For three or, preferably, five days before attacking the worm the patient should take only food sufficient to sustain life, and this must be such as will be almost entirely absorbed by the stomach. Two pints and a half of beef tea or an equivalent quantity of Brand's essence may be given, with, if necessary, a glass or two of port wine, but no solid food or milk should be allowed. The period of starvation must be regulated by the strength of the patient; its duration should never be less than three days, and is preferably five days, or even a whole week. Every morning a small dose of some laxative, such as cascara sagrada in capsules, should be administered. Castor oil should not be given during this stage of the treatment, as it is believed to protect the worm from the action of the anthelmintic to be subsequently administered.

When the period of fasting is over the anthelmintic drug must be given. The oil of male fern is the most efficacious remedy against tape-worms. It is best prescribed in capsules each containing 15 minims, at intervals of a quarter of an hour, until four capsules have been taken. Administered in this way it is more efficacious, less nauseous, and less likely to cause vomiting than if given in a single dose of a drachm, in an emulsion, as is usually recommended. The last capsule should be followed in half an hour by $\frac{1}{2}$ ounce of castor oil. When the bowels act the motion should be passed into an utensil loosely covered with muslin. Water should be gently poured over it, and the practitioner must himself examine the worm before its removal and search carefully for the head, as if this be not passed the animal is certain to grow again. In addition, by placing the fragments end to end, he must determine whether all belong to the same worm, as two or more may be present. When the examination is finished, the worm should be burnt.

If the head be missing, the male fern should be given again in four doses as before, to be followed by a dose of castor oil. If the head be not found at the second attempt, unless the patient be too weak to bear it, the male fern and castor oil should be administered again after an interval of an hour. In a case under the care of the writer the head was not found until the third attempt, although all but about an inch of the worm was passed after the first dose of the male fern. If the head be found and the examination of the portions of worm passed show that only one is present, the patient is cured; but if the head be missing at the conclusion of the treatment, it is still possible that it may have been passed but overlooked.

As the period of maturation is almost invariably three months, or it may be exactly thirteen weeks, it follows that should no segments appear in the motions after an interval of four months, this has probably happened, and the case may be regarded as cured. If large portions of tape-worm, including part of the neck, be passed, and segments spontaneously appear in the motions after an interval of less than two months, it may be certainly concluded that two worms were originally present in the intestine. The only prophylactic measure against tapeworms is to avoid eating raw or imperfectly cooked meat. Children have been known to acquire them from

raw meat taken under medical advice.

Oil of turpentine is also used, in doses of from 1 to 2 ounces, emulsified with white of egg and sugar. Pomegranate root, 3 ounces macerated in water for twelve hours and then concentrated to one-half, is also recommended, but it is apt to produce digestive disturbances. Kousoo, kamala, and areca nut are other remedies sometimes prescribed.

TASTE, DISORDERS OF.—The sense of taste may be impaired or lost from a variety of causes which may be thus classified:—

1. Morbid conditions of the mucous membrane of the tongue and palate.
2. Lesions of the nerves concerned in the conduction of the sensory impressions.
3. Certain cerebral conditions.

Many of the sensations ordinarily spoken of as sensations of taste are really due to the perception of flavours by the olfactory nerve. As stated under *ANOSMIA* (*q.v.*) loss of smell implies the loss of all these sensations, the true taste impressions being limited to such as are either bitter, sweet, sour, or salt.

1. Morbid conditions of the mucous membrane of the tongue and palate are more often concerned in causing an impairment of the sense of taste than in its total loss. The parts of the mouth capable of receiving taste impressions are the tongue, the palate, and the palatine arches. A dry condition of the tongue and a very thick coating of fur on its surface are sufficient to cause a dulling of the sense of taste, and it may be completely lost over limited areas of disease, although owing to the large surface over which the impression may be received, such a loss will probably be unnoticed by the patient.

2. The nerve chiefly concerned in the conduction of impressions of taste is the fifth. It is stated in the article on the glosso-pharyngeal nerve that it is the nerve of taste for the posterior part of the tongue and the soft palate, a view which is perhaps the one most generally accepted, but as no case is on record in which taste has been lost over these parts from a lesion limited to the glosso-pharyngeal nerve, and as disease of the root of the fifth nerve has been known to cause complete loss of taste in these parts, and also in front of the tongue, it is more probable that the fifth nerve subserves this function; and that if

fibres apparently distributed with the glosso-pharyngeal nerve are concerned in conveying taste impressions they subsequently leave that nerve and pass to the brain by the fifth. When paralysis of the fifth nerve occurs without loss of taste it is probable that the taste fibres escape owing to the lesion being partial only or to its being situated within the pons, where these fibres are probably separated from the fibres conveying common sensibility.

The impressions from the tip and sides of the tongue are almost certainly conveyed by those fibres of the lingual or gustatory nerve which it obtains from its communication with the chorda tympani, and it is also almost certain that the latter is the nerve of special sense for these parts of the tongue, a view which accounts for the loss of taste in the front of the tongue so often observed in disease of the middle ear, through which the chorda runs, and also in cases of facial paralysis of rheumatic origin. But as in disease of the facial nerve within the skull there is no affection of taste, it follows that the fibres of the chorda leave the facial again. It is believed that they pass from the geniculate ganglion of the facial, through the Vidian nerve, to the sphenopalatine ganglion, and thence ascend, in the superior maxillary division of the fifth nerve, to its root and to the brain. In caries of the middle ear there may be loss of taste on both the back and the front of the tongue.

3. In certain lesions of the hemispheres, in general hemianæsthesia, and also in hysteria, there may be complete loss of taste on one or on both sides.

Tests.—The condition of the sense of taste may be tested by placing various substances on the protruded tongue, the patient's eyes being closed. The quantity of the substance must be small, so that it may not be diffused over the surface, and the taste must be perceived before the tongue is withdrawn. The best substances for the four varieties of taste are for bitter, quinine; for sweet, honey; for sour, vinegar; for salt, common table salt. On applying a feeble electrical current to the tongue a metallic taste is perceived; this constitutes one of the best tests.

Treatment.—When the sense of taste is lost, the treatment depends upon the causal condition.

TENESMUS is the name given to a group of symptoms referable to the large intestine, of which the most constant and

important is straining during defæcation. There may also be a sense of weight and fulness about the rectum and a frequent inclination to stool. The motions are usually slimy and may contain blood. Tenesmus is a marked feature of dysentery.

TETANUS, IDIOPATHIC.—An acute affection characterized by a more or less continuous tonic spasm of the voluntary muscles with paroxysmal exacerbations of great severity, during which the head, trunk and lower extremities are maintained in an arched position, owing to the predominance of the action of the extensor over the flexor muscles (Ross).

The idiopathic form is that in which no evidence of any wound or external injury can be discovered, the malady being, it is supposed, due to cold or wet, though sometimes there is no evidence of such exposure. It differs in no respect from the traumatic form except that the disease, as a rule, runs a less acute course and is less fatal.

Symptoms.—The onset is marked by chilliness or actual rigors, followed by difficulty in articulation, in swallowing, or in yawning, or by some stiffness of certain muscles of the face and neck. The masseters and other muscles of mastication are usually the first to be attacked, giving rise to the well-known and dreaded "lock-jaw" or "*trismus*." As the other muscles of the face are affected the features become drawn, all the lines of the face being so much exaggerated that the patient presents an aged appearance; the angles of the mouth are drawn apart so that the lips are pressed against the teeth producing a grin—the "*risus sardonicus*." The spasm spreads to the trunk and limbs and the body is arched backwards, the legs extended, and the head thrown back, the patient when in the supine position resting only on his head and heels, a condition known as *opisthotonos*. When, as happens in rare instances, the trunk is arched forwards or laterally, there is said to be *emprosthotonos* or *pleurosthotonos*. The eyes are staring or half closed, the pupils contracted, the chest is fixed, the abdomen flat or sunken, and the abdominal walls exceedingly hard. The larger joints of the extremities are generally rigid, but the smaller sometimes escape, though the hands are often clenched. Pain at the epigastrium, of a very severe character, extending through to the back,

is so common that it has been regarded by some as almost pathognomonic.

The spasm undergoes paroxysmal increase, but in the intervals there is never complete relaxation; occasionally the spasm is continuous. Each paroxysm may last from a few seconds to some minutes, and including slight remissions, even for some hours; as the disease progresses they tend to become more frequent and more severe. Generally there is a little fever, occasionally hyperpyrexia; the pulse is at first unaffected, but towards the end becomes rapid. The mind is usually clear, unless delirium supervene at the close. There is often profuse perspiration with the development of sudamina. The tongue is coated and the mouth clogged with viscid saliva; the bowels are generally obstinately confined, the urine is scanty and of high specific gravity.

Death may occur at any time after the third day, and, as has been already stated, the duration of the disease is generally shorter in the traumatic form. In the early stages death generally takes place during a paroxysm, and is then due to suffocation from the fixation of the chest. At a later stage death may be due to heart failure or fever; sometimes it may occur from mere exhaustion as late as the third week, when all danger seems almost at an end.

The *diagnosis* does not, as a rule, present much difficulty, but the possibility of hysteria must always be borne in mind. Strychnine poisoning has many features in common with tetanus, but there are two cardinal points which should serve at once to distinguish between them; in strychnine poisoning the muscles of the jaw are never affected till late, and in the intervals between the paroxysms the patient is quite free from any spasm.

The *prognosis* must always be grave, but not so grave as in the traumatic form.

Pathology.—Very little is known as to the exact nature of the disease; that there is some affection of the centres in the medulla and spinal cord cannot be doubted, but no constant changes have as yet been recognized. In many cases microscopical examination of these parts has revealed infiltration with leucocytes, multiplication of connective-tissue corpuscles, and various alterations in the multipolar nerve cells.

Treatment.—The patient should be kept quiet in a darkened room, and his

food, which must be nutritious, should be given in a fluid form; if, owing to the spasm of the muscles of the face, he can neither take it by the mouth nor bear to be fed by means of a catheter passed through the nose, nutrient enemata and suppositories must be used, or chloroform may be administered and then a tube passed down the œsophagus. Opium, chloral hydrate, Calabar bean, and curare are the remedies which have proved most successful in overcoming the spasm, but it is by no means an easy task to bring the patient fully under the influence of any of these drugs. The hypodermic injection of morphine presents advantages over all other methods of treatment. When the paroxysms are very severe relief can only be obtained by keeping the patient more or less continuously under the influence of chloroform, and until more is known of the essential nature of the disease this is perhaps all that can be expected from treatment. JOHN ABERCROMBIE.

TETANY.—A tonic spasm of the extremities occurring chiefly in rickety infants and lasting a variable time.

Symptoms.—The attack commences more or less suddenly with numbness and tingling in the fingers. This is soon followed by stiffness and drawing of the hands into the typical position, with the thumb adducted to the palm but not flexed, and all the fingers adducted to the middle line of the hand, so that this is a little arched. The fingers are only slightly flexed at the metacarpophalangeal joints, but the wrists, elbows and knees are usually somewhat flexed. The fingers may be separated when the attack is passing off. The feet are also arched and the toes adducted, the dorsum of the foot being tense and swollen; the hands and feet are usually very painful and tender; the back of the hand is swollen and tense, but does not pit. If the stiffness be overcome by force, the hand immediately resumes its position when the force is removed. In rare cases the muscles of the face about the jaw may also be in a state of contraction.

The spasm may last only a few minutes, though its duration is usually from a few hours to some days or even weeks; it does not disappear during sleep, and is unaltered during chloroform anaesthesia. The attack passes off gradually, and as it does so there is a feeling of numbness and tingling; relapses occasionally occur. Facial irritability and

laryngismus (*q.v.*) are constant accompaniments of tetany in children. Fever is not always present. The peripheral nerves may show an increased irritability to both the induced and constant currents. Convulsions when present are probably due to some independent cause, they do not appear to have any connection with, or any influence over, the tetany, which may persist through them unaltered. Recovery is the rule, but the patient may die from suffocation during an attack of laryngismus.

Prognosis.—Except in the most severe cases there is a tendency to spontaneous recovery in the course of a few days.

Pathology.—No central changes have yet been discovered, the symptoms would point to reflex irritation of the spinal cord as the determining cause; the persistence of the spasm during sleep, chloroform anaesthesia and convulsions shows that the brain has no share in the causation.

Ætiology.—This disease is seldom met with except in rickety infants during the first three years of life, but it occasionally occurs in older children and even in young adults of both sexes, and has been specially described by Trousseau as occurring in young nursing women. In the case of older children and adults it is always difficult to determine what share hysteria may have had in its production. The exciting cause in these cases is often a definite chill. In children usually some source of reflex irritation can be found, intestinal derangement being present in a considerable proportion of the cases. Teething, apart from rickets, does not seem to be a cause. Often other children in the family have suffered from it, and frequently one or other parent is neurotic or has neurotic antecedents.

Treatment.—Wrapping cold water bandages round the affected limbs always relieves the spasm pain and tenderness and should never be omitted. The bandages should be renewed every three hours until the spasm is completely relaxed and the limbs can be manipulated without any pain. In all cases careful attention to the diet and to the hygienic surroundings is of the first importance in the treatment; any source of reflex irritation such as diarrhoea, worms, or eczema, should be sought for and obviated. Where nothing of the kind can be discovered nervine sedatives may be tried, Calabar bean ($\frac{3}{8}$ grain thrice daily for a child aged two years) being probably the best. Bromide of potassium, chloral and morphine have

also been given with success in some cases. In adults the possibility of hysteria should be borne in mind in directing the treatment. In children the administration of cod-liver oil and steel wine is always useful.

JOHN ABERCROMBIE.

THIRD NERVE, DISEASES OF.—This nerve, the motor nerve of the eyeball, arises from its nucleus of large cells in the floor of the aqueduct of Sylvius on either side of the middle line, in the neighbourhood of the corpora quadrigemina. The nerve runs forwards through the crus, and emerges at the interpeduncular space, courses along the outer wall of the cavernous sinus, and enters the orbit through the sphenoidal fissure dividing into two branches; the superior supplies the superior rectus and the levator palpebræ superioris, while the inferior supplies the internal rectus, the inferior rectus and the inferior oblique muscles. Besides these the nerve also supplies the ciliary muscle and the constrictor muscles of the iris. According to Hensen and Voelcker, these different functions are arranged in the nucleus of the nerve in the following order from before back. Most anteriorly is the centre for accommodation, then for the reflex action of the iris, next for the muscles, the internal rectus, the superior rectus, levator palpebræ and inferior rectus, while below them is the fourth nucleus, for the superior oblique. Muscular paralysis and spasm are the affections which result from lesions of the third nerve.

Paralysis.—This will differ in its distribution accordingly as the nucleus or the nerve trunk is involved; when the former is affected, the symptoms will vary according to whether the whole nucleus is paralysed, or different parts of it, as described above. When the whole nucleus is affected, the lesion is frequently associated with disease of the nuclei of the other ocular nerves, and the ophthalmoplegia externa and interna of Hutchinson is the result, all movements of both eyes being lost together with the reaction of the pupils to light, and the power of accommodation (*see* OPHTHALMOPLÉGIA). The loss of the pupil reflex (Argyll-Robertson pupil) is a well-known symptom of locomotor ataxia, and occurs without any other part of the nucleus being affected. The trunk of the nerve is affected by hæmorrhage or softening in the crus cerebri, by meningitis or growths, or aneurysm in the interpeduncular space; by

rheumatic disease of the nerve in the wall of the cavernous sinus; by syphilitic disease of the membranes there, or aneurysm of the internal carotid artery. The nerve may also be affected in diphtheritic paralysis, and in tabes dorsalis. In the orbit the nerve or its individual branches may be compressed by growths. When the whole trunk is affected, the eye cannot be turned in any direction except outwards and outwards and downwards; there is external strabismus, with diplopia, ptosis, and loss of accommodation. The pupil is of medium size, but does not contract to light or on accommodation. When the different branches of the nerve in the orbit are involved, the individual muscles supplied are paralysed. Thus, when the right *superior rectus* is paralysed, the eye cannot be turned upwards, and in trying to do so the eyeball is rotated on its antero-posterior axis out and down by the inferior oblique; secondary deviation—*i.e.*, the overaction which the sound eye executes when the paralysed eye tries to fix an object above it and which the sound eye is prevented from seeing, is by the left superior rectus; there is diplopia for objects seen in the upper half of the field of vision, the images being side by side and one above the other; they are crossed—*i.e.*, when the right eye is covered up, the left image, which is also the higher of the two disappears; the further the object is removed from the horizontal line, the greater the separation of the images.

In paralysis of the right *inferior rectus*, the symptoms are similar, though the direction is reversed; movement is defective downwards, the eyeball being rotated on its antero-posterior axis out and up by the superior oblique; secondary deviation is by the left inferior rectus; there is diplopia for the lower half of the field of vision, the images are side by side and are below the other, they are crossed, the left and lower image disappearing when the right eye is covered up; the separation increases downwards from the horizontal line.

When the right *internal rectus* is paralysed, there is a divergent squint, and the eye cannot be turned inwards; secondary deviation is by the left external rectus. Diplopia occurs in looking at objects to the left of the middle line, the images are side by side, and become further separated as the object is moved to the left; they are crossed—*i.e.*, the left image disappears when the right eye is closed.

With paralysis of the right *inferior oblique*, there is defective movement upwards, for the muscle works with the superior rectus; secondary deviation takes place by the left inferior oblique and superior rectus. Diplopia is for objects in the upper field, and is simple, —i.e., the false image is to the right, the images are side by side, the false one being the higher, and the distance between them is increased by looking to the left, whilst on looking to the right the false image becomes oblique, converging towards the horizontal line.

Spasm occurs in some of the muscles supplied by the third nerve, and especially the internal rectus and levator palpebre; the former condition is met with in hysteria, meningitis and hypermetropia. Clonic spasm of the muscles occurs in nystagmus, especially in the form affecting miners.

Diagnosis of paralysis, when the whole trunk is involved, is not difficult, but when single muscles are affected, and strabismus is not a marked symptom, the position and behaviour of the double image will assist the diagnosis.

Prognosis.—When the paralysis is due to organic growths or an affection of the nucleus, as in ophthalmoplegia externa, the prognosis is unfavourable, but favourable when caused by rheumatic or recent syphilitic disease, or after diphtheria. In *tabes dorsalis*, in the early stages, the prognosis is favourable, but in the latter the paralysis is usually permanent.

Treatment.—If the paralysis be due to organic disease, the treatment is that suitable for the disease. When due to cold, hot fomentations may be applied and be followed by a blister on the temple just outside the orbit, and tonics may be given. Iodide of potassium in increasing doses should be administered if syphilis be the cause of the lesion. After diphtheria, the paralysis usually recovers with tonic treatment. The constant current may be employed (very weak), the negative pole being applied to the closed eye, and the positive pole placed at the back of the neck. In cases of spasm the best results are obtained by counter-irritation to the temple.

C. E. BEEVOR.

THOMSEN'S DISEASE (Myotonia Congenita).—An hereditary disease occurring in several members of the same family. Upon the attempt to use any of the voluntary muscles the patient finds that contraction is slow, and relaxation is still slower because the muscles

remain tonically contracted for some seconds. Much the same result is noticed upon the application of any form of stimulus to the muscles. There are certain characteristic electrical reactions. Under the microscope the muscular fibres are found to be hypertrophied.

It is usually said that Sir Charles Bell first described this disorder, but it is doubtful whether his cases were really examples of Thomsen's disease. Two cases were mentioned by Benedikt in 1864, and Leyden referred to it about the same time, but it was the publication in 1876, by J. Thomsen, of a description of the disorder as it existed in himself and members of his family which first directed attention to it. Erb, in 1886, published a monograph on the subject, and he has recently issued an article bringing his previous account up to date. In England four cases have been exhibited at the societies. Dr. Buzzard described two cases in the *Lancet* in 1887, and a full account of the disease appeared in the *Guy's Hospital Reports* for 1889. Cases have occurred in Germany, France, England, Russia, Italy, Sweden and America. Up to the present date about 50 cases have been put on record.

Symptoms.—The chief of these is a peculiar stiffness, as the patient calls it, which accompanies voluntary movements. Involuntary movements are never affected. The peculiarity of movement consists in the fact that the contraction of the muscle the patient wills to move, is slower than normal, that it persists, and then relaxes gradually and very slowly, consequently the muscle remains contracted for some seconds and this contraction is so strong that the antagonistic muscles cannot overcome it. If a series of similar voluntary movements be made one after another, the patient begins to execute the second movement before the first contraction has completely relaxed, and his difficulty as regards stiffness gradually becomes less and less in each movement. For example, if he be standing still and set out to walk he puts forward one leg rather slowly, it then remains stiff for a few seconds; the next time it is moved the stiffness is less, and soon he walks quite comfortably even for miles, but if he trips against a stone this brings into play some new movement, and the muscles performing it become stiff and he may fall down. The acts of respiration, micturition, defecation and parturition have never been observed to

be implicated, but with these exceptions the stiffness may be noticed in any movements executed by voluntary muscles. The muscles of the extremities are most commonly implicated, some of the rarest to be affected are the muscles of deglutition, those of speech, those of the eye, and the interossei. The muscles are well formed, sometimes they are a little increased in bulk; there is slight diminution in power. Erb gives the following points as characterizing the "Myotonic Reaction" (MyR.). (1) The contraction of the muscles upon mechanical stimulation of the motor nerves is normal. (2) Mechanical stimulation of the muscles, as by repeatedly hitting them with a percussion hammer, easily produces contractions lasting from 5 to 30 seconds. (3) The motor nerves are quantitatively normal to the faradic current, but strong closing currents induce long lasting contractions. (4) The motor nerves are quantitatively normal to the galvanic current, but strong closing currents produce long lasting contractions. (5) The effect of the faradic current applied to the muscles is the same as when it is applied to the nerves. (6) The galvanic current applied to the muscle shows that opening contractions are very difficult to obtain, that the closing contractions are of very long duration; that anodal closing contractions (ACC) are as easy or more easy to obtain than kathodal closing contractions (KCC), and that upon stable application, well formed, wave-like contractions may be seen to pass from the kathode to the anode. Almost all observers have obtained all these features of MyR, except that very few have found the wave-like contractions, and there is some doubt as to the response of the muscles to mechanical stimuli to the nerves. Pain upon contraction of the muscles is excessively rare. The latent period is probably normal, although there are some differences of opinion on this point. Myographic tracings bring out the features of the movement very well. The difficulty of movement is usually, but not always, increased by mental excitement or cold. It is often said to be diminished by alcohol, digestion and warmth. The reflexes are normal; there are no sensory symptoms. The muscular fibres excised during life are wider (from two to four times) than normal, the transverse striation is indistinct, the border of the fibre is irregularly curved, the muscle nuclei are increased in number and sometimes there is a slight excess of interstitial tissue.

Course of the Disease.—It is usually first observed during childhood, most often at about the age of eight or nine the child notices that it cannot take part in games. The difficulty of movement, as a rule, becomes worse at puberty. It is doubtful whether recovery ever takes place, usually the trouble is slowly progressive. It usually incapacitates from almost all occupations.

Diagnosis.—This is not difficult if the salient points are remembered, but all sorts of obscure cases of muscular spasm are incorrectly described as Thomsen's disease.

Prognosis.—This is bad. No certain case of recovery has been recorded. Thomsen found he was better the more active his life. One woman is said to have improved when she married.

Pathology.—The only pathological basis for the disease is in the muscular fibres. That these are its seat is supported by the following facts: (1) The histological changes in them; (2) Thomsen-like contractions can be produced upon direct stimulation of the muscles of the frog, even when the end plates have been paralyzed by curare, if the animal has been brought under the influence of sodium phosphate; (3) some animals possess in each muscle two sorts of fibres, white, which contract quickly, and red, which contract slowly; (4) the muscles of new-born animals also contract very slowly. Bernhardt has suggested that the disease is an hereditary defect of muscular development. Some have supposed that the nervous system is also at fault, but of this there is no evidence.

Etiology.—Rarely it has been ascribed to fright, but it is uncertain whether this ever has any causative relation, probably not. It is strongly hereditary, occurs in many members of the same family, and is directly transmitted by fathers and mothers to both sons and daughters.

Treatment.—None has been of any avail. Tonics, electricity, electric baths and massage have all been tried.

W. HALE WHITE.

THREAD-WORMS (*Oxyuris Vermicularis*).—The thread-worm is a minute filiform nematode, of which the female is the longer, though less than half an inch in length; the female is full of ova, the eggs being oval in shape. It is supposed that the eggs are swallowed with fruit or vegetables, and that the embryos are liberated in the stomach.

Re-infection afterwards takes place without any external source of infection, the child (for the affection is much more common during childhood than subsequently) scratches the anus, and so gets some of the ova under his nails, when they find their way into his mouth at meal times. According to Cobbold, the cæcum is the habitat of the thread-worm.

Symptoms.— Unless the worms are actually seen either about the anus, in the bed, or in the motions, it should not be taken for granted that a child is suffering from thread-worms. They are apt to produce heat and irritation about the anus, as also about the vagina and prepuce, whither possibly they are transferred by the hands of the child rather than by spontaneous migration. Children suffering from worms are often restless and irritable; they pick at their noses, have twitchings of the face and limbs, and sometimes even convulsive movements. Leucorrhœa may be set up in little girls, and thread-worms have been regarded as one of the causes of masturbation. There may also be diarrhœa and slimy motions, with a tendency to prolapsus ani.

Treatment.— Popular superstition attaches much importance to so-called worm powders, and a dose of three grains of powdered rhubarb with half that quantity of carbonate of soda may be given to an infant under one year to bring away the worms; such a powder often does expel large quantities of thread-worms. Its administration should be followed up by a small enema (not more than three ounces) of salt and water, or a similar quantity of infusion of quassia may be used, and except in inveterate cases, the repetition of the enema on two or three successive evenings is usually sufficient to rid the patient of his trouble. In the more chronic cases cod-liver oil and steel wine may be given internally with benefit, whilst calomel and jalap may be substituted for the rhubarb and soda, and small doses of perchloride of iron may be added to the enemata. In adults the same treatment should be adopted, but the cases are often more rebellious. Saline mineral waters, such as Friedrichshall and Hunyadi Janos, are of service in these cases. The strictest cleanliness should be adopted, and the child's hands should be muffled and tied up at night so as to avoid the possibility of re-infection taking place as above described.

THROMBOSIS.— The process of coagulation of the blood within the heart and vessels during life.

The resulting product of coagulation is termed a *thrombus*. The essential cause of coagulation is the formation of *fibrin*, which, according to Hammarsteon, is derived from the action of a *ferment* upon fibrinogen contained in the plasma. Formerly it was believed that fibrinoplastin was also necessary (Schmidt theory). According to Wooldridge, lecitin is the essential agent in the production of fibrin by its action upon B fibrinogen, one of three fibrinogens which he asserts exist in the blood.

The disintegration of the white corpuscles continually produces this ferment, but not in sufficient amount to cause coagulation in health. It is more abundant in venous blood than arterial. Recent observations have shown that this ferment is derived not only from leucocytes, but also from the blood plates, or from microcytes, and the formation of thrombi has been especially ascribed to their agency. If a foreign body such as a thread be introduced into the circulating blood, it will be covered, after a short time, with leucocytes and microcytes, which serve as a starting-point for coagulation.

The blood, in order to remain in a fluid state, must be in contact with the healthy endothelium, which forms the wall of the capillaries and the internal lining of the remainder of the cardiovascular system. Should this be damaged, coagulation will occur at the point of injury. The vessel, denuded of epithelium, acts like a foreign body, the leucocytes and microcytes adhere to it, the result is the formation first of ferment, and then of fibrin. Retardation of the circulation is not, of itself, a direct cause of thrombosis, but it is a very important factor in its production, firstly by favouring the accumulation of leucocytes, and secondly by causing impaired nutrition of the vessel wall.

Thrombosis may arise from two causes, which generally co-exist:

1. INJURY AND DESTRUCTION OF THE CARDIO-VASCULAR ENDOTHELIUM.—

- (1) The process of obliteration of a vessel by ligature, torsion and cautery, is an example of simple injury without any abnormal condition of the blood.
- (2) Inflammatory conditions of the cardio-vascular system, such as *endarteritis*, *endocarditis* and *phlebitis*, whether originating primarily in the intima, or extending from inflamed circumjacent tissues

are the commonest causes of thrombosis. (3) Foreign bodies and newgrowths may cause thrombosis of the veins by piercing the walls of the vessels. (4) Imperfect nutrition of the vessel walls, due to slowing of the circulation and poverty of the blood, is another important factor in such cases; leucocytes are frequently in excess in the blood. The affection occurs with especial frequency in the veins of the lower extremities, also in the auricular appendices, the apices of the ventricles and between the trabeculae of the heart.

II. ABNORMAL CONDITIONS OF THE BLOOD.—In septic fevers, typhus, septicaemia, erysipelas and pyæmia, the amount of fibrin ferment is greatly increased, owing to the breaking up of leucocytes, possibly by the agency of micro-organisms. This condition of the blood is usually associated with a failing heart and loss of vascular tone. The circulation is thus retarded, and the endothelium is liable to be damaged.

There is a tendency to thrombosis in the later months of pregnancy and after profuse hæmorrhage, also in certain diseases, as typhoid fever, diabetes, Bright's disease, gout, phthisis, and cancer. After parturition, thrombosis of the iliac veins is liable to occur, causing phlegmasia dolens (*q.v.*)

Varieties of Thrombi.—Red thrombi are uniform red clots, soft in the early stages. They form from the blood by coagulation when the circulation through a vessel has ceased—*e.g.*, after ligature or embolism.

White or Mixed Thrombi are found in the circulating blood; the foreign body or damaged vessel serves as a surface of attraction for the sticky leucocyte and microcyte. These adhere and form ferment, which causes a deposition of fibrin from the blood. The deposit is frequently stratified, and the strata may present different colours owing to the varying numbers of red corpuscles in the coagulum, this being dependent upon the degree of slowing of the circulation. Thrombi may be further divided into *obliterating*, or those which completely fill the vessel, and *parietal*, or those which adhere to some portion of the wall. The former are generally red, the latter colourless.

When a thrombus extends, whether in an artery or vein, it is always towards the heart; hence thrombosis of the iliac veins may extend to the inferior vena cava and give rise to symptoms of obstruction of that vessel.

Cardiac Thrombi.—The distinction of *ante-mortem* from *post-mortem* clots in the heart is of importance. The former are found especially in the auricular appendices and at the apices of the ventricles, they have a smooth or ribbed surface, buff or variegated colour, and usually vary in size from a pea to a large filbert; they often occur in groups which are continuous with one another. They may be of uniform consistence on section, but more frequently their centre is broken down from degenerative changes into a thick reddish-yellow pus-like fluid consisting of cholesteroline, fat granules and degenerated blood corpuscles. They cannot be removed, being firmly adherent.

Post-mortem clots are often like black-currant jelly, the portions prolonged into the arteries being usually fibrinous, while those of the veins and pulmonary arteries are soft and black. They are readily removed, and in no case adherent. Often during the death agony clots are forming in the heart for some hours. These consist almost entirely of fibrin; they are opaque, buff-coloured, it may be even slightly laminated, but they are only entangled and never really adherent; they are moister and tougher than *ante-mortem* clots, and never show the yellow hue of degeneration.

The changes which may occur in thrombi are *decolorization* from changes in the hæmoglobin and absorption of the pigment, *softening, organization* or conversion into fibrous tissue, *canalization* or channeling of the thrombus, and lastly *calcification*, giving rise to a phlebolith.

The softening may be *simple*, the degenerative changes taking place in the centre; or *puriform*, as in cases of *infective thrombosis*. The latter occurs when germs gain admission to the thrombus, or when the process which excites thrombosis is a septic one. As an example, infective thrombosis of the lateral sinus occurring in purulent otitis media may be mentioned.

In connection with the obstruction of vessels by blood-clots it is well to bear in mind, first, that thrombosis is the cause of obstruction when it exists in the pulmonary, hepatic, and systemic veins; secondly, that arteries and the portal vein may be obstructed either by thrombosis or embolism; and, thirdly, that when obstruction occurs in the pulmonary arteries associated with pre-existing venous thrombosis, it is due to embolism.

The results of thrombosis are (1) those due to mechanical obstruction of the circulation, and (2) the dislodgement of simple or infective particles into the circulation with the production of embolism.

The results of venous thrombosis depend in great measure upon the possibility of collateral circulation being established; the conditions are the same as those produced by the obstruction of veins from whatever cause—namely, swelling and œdema of the part, with compensatory enlargement of anastomatic vessels. If the obstruction lasts for some time, the tissues become indurated as the result of mechanical congestion.

The organ which is specially liable to be affected by arterial thrombosis is the brain, but the changes which result are much the same whether the obstruction be by thrombosis or embolism. For this reason, the results of arterial thrombosis are more conveniently discussed together with those produced by embolism, and will be found in the article on the latter subject.

F. W. MOTT.

THRUSH.—A form of stomatitis due to the presence of a vegetable parasite termed the *Oidium Albicans*.

Symptoms.—The disease commences with the formation of circular spots about the size of a pin's head, slightly elevated, and of a white colour, on the tongue, gums, buccal mucous membrane, or pharynx. It does not extend into the larynx, nor has the white membrane, which is characteristic of the disease, been found beyond the œsophagus. If the course of the disease be unchecked, the spots gradually coalesce until in some cases the mucous membrane of the mouth is covered with patches of a whitish colour. The membrane is at first slightly adherent, so that a little oozing of blood follows attempts to remove it. Thrush is usually ushered in with some febrile disturbance and gastrointestinal irritation, such as sickness, diarrhœa, and abdominal pain and tenderness. In cases running a fatal course the patient becomes drowsy, there is profuse diarrhœa with foul smelling stools, and the nates and anus become red and excoriated.

Diagnosis.—The only condition with which thrush is at all likely to be confounded is simple aphthous ulceration; its differentiation from the latter will be found under APHTHÆ.

Prognosis.—In children who are under favourable conditions, and who can be

kept clean, the disease generally yields readily to treatment; but in adults, on the other hand, it usually indicates the commencement of the end, though cases of recovery do occur even when patches of membrane of a considerable size have formed.

Pathology.—As already stated, the essence of the disease consists in the presence of a vegetable parasite, the *oidium albicans*, and it is now generally admitted that this is identical with the *oidium lactis*, the ferment fungus on the presence of which depends the acid fermentation of milk. When the white membrane of thrush is examined microscopically, it is found to be composed of spores and filaments with a granular basis.

Ætiology.—Thrush is for the most part a disease of infancy, occurring almost exclusively in children brought up by hand, but it may be met with in old people and in persons exhausted by some wasting disease, such as cancer or phthisis.

Treatment.—The important indication is the observance of the most scrupulous cleanliness in everything used for the child, especial attention being paid to the state of the bottle. The mouth should be carefully swabbed out two or three times daily with a weak solution of carbolic acid, permanganate of potassium, or sulphurous acid. In the interval a spray composed of 20 grains of borax and 20 minims of glycerin in an ounce of water may be used. If, in children brought up by hand, the disease does not yield to the treatment just recommended, a wet nurse should be engaged, and recovery may then be expected even in cases apparently hopeless. In a very severe case occurring in an adult observed by the writer the administration of a lozenge containing $\frac{1}{4}$ grain of cocaine and 5 grains of chlorate of potassium every three or four hours speedily effected a marked improvement in the local condition, and enabled the patient to take food without pain.

F. DE HAVILLAND HALL.

TINEA VERSICOLOR (Pityriasis Versicolor).—A disease of the skin due to the presence of a vegetable parasite—*microsporon furfur*—and characterized by the existence of fawn-coloured or brown, slightly scaly patches, usually confined to the trunk.

Tinea versicolor is common, but its discovery is frequently accidental, as it seldom causes subjective symptoms of sufficient intensity to prompt application

for relief, but a severe form is said to exist in the East. It is essentially a disease of middle life, being rare below fifteen and above forty-five years of age. It runs a chronic course, and is subject to considerable exacerbations and remissions according to the amount and condition of the sweat secretion. The affection is, therefore, generally worst in warm weather and its relative frequency in phthisical subjects who perspire freely is thus explained.

Eruption.—The favourite seats of the disease are the front of the chest, the abdomen and the interscapular region. The lesions consist, at first, of small, cir-

“complexion” of the patient—*i.e.*, the amount of pigment normally present in the skin. Their surface is finely scaly, their edge sharply defined although only slightly elevated. Scraping with the nail or with a knife removes the scale and discoloration. Occasionally, especially after violent exertion and in summer, the patches inflame, become eczematous and itchy, some difficulty in diagnosis being thereby produced. The fungus, which lies in the most superficial horny layers of the epidermis, can be easily demonstrated by microscopic examination of scrapings after their treatment with ether and liquor potassæ



Mycelium and Spores of *Microsporon furfur*.

cular, discrete spots which soon coalesce to cover extensive, irregular areas and may finally cover, almost uninterruptedly, the whole trunk. Generally, however, the distribution is more patchy, and round the main tract of disease there are outlying islets, roughly circular in outline. Extension to the upper arms and thighs is common, and the disease may spread occasionally as far as the wrists and ankles, but its occurrence on exposed parts (*e.g.*, face and hands) is extremely rare. The fungus has, however, been found in a case of apparently simple seborrhœa of the scalp. The colour of the patches is yellowish, fawn or some deeper tint of brown, according to the

or acetic acid. It consists of closely interlacing, fine mycelial threads or tubes, and of triangular or pyramidal heaps of small, brightly refracting, circular, nucleated spores which often lie at points of intersection of the mycelial threads. Some experiments made in France tending to show some relationship to the bacillus tuberculosis, or, at all events, the power of *microsporon furfur* to produce tuberculosis when injected into animals, have received neither credence nor confirmation elsewhere. Although undoubtedly contagious, *T. versicolor* is so to a very limited degree only.

Diagnosis.—The affection can only be mistaken for lichen circinatus (eczema

seborrhœicum corporis), pityriasis rosea, erythrasma, pigmentary syphiloderma, or other disorders of pigmentation, but in doubtful cases the microscope will at once clear up the diagnosis.

Treatment.—Repeated and vigorous washings with hot water, soft soap and a flesh brush, or a piece of flannel, are necessary to remove greasiness and scales previous to the application of the parasiticide lotion or ointment. Ointments of sulphur or chrysophanic acid are efficacious but disagreeable remedies. A lotion of hyposulphite of soda (5j ad 5j) is that most usually employed, and probably the previous dabbing on of vinegar, which causes the decomposition of the hyposulphite and the production of sulphurous acid in an active state, is an improvement. It is generally advisable to continue treatment after apparent cure has resulted, as little islets of disease, where the parasite is perhaps unusually deep in the epidermis, are apt to pass unperceived. It is also a wise precaution to destroy all clothing worn next the skin; silk is a preferable material to flannel for the underclothing of persons liable to the disease.

Erythrasma.—A rare disease of the skin to which certain authors are inclined to assign no place as a morbid entity, but to consider it as a phase of *Tinea versicolor* or *Tinea cruris* (*eczema marginatum*), or even as an intermediate condition between the two.

Erythrasma always attacks the axillæ or inguinal regions, nates and immediately neighbouring regions. It forms reddish or brownish, sharply defined, slightly raised, desquamating patches, which cause no itching or inconvenience, and may thus pass for years unperceived. In the one indubitable case seen by the writer, in a man, it occupied the entire gluteal region. The micro-organism—*microsporon minutissimum*—consists of densely packed, very fine, interlacing threads, none of which branch or segment. Observers differ with regard to the presence of spores, the majority, however, have not observed them.

The condition is readily curable by the same means as *Tinea versicolor*.

J. J. PRINGLE.

TINNITUS.—A singing, ringing, or other kind of noise in the head; a frequent accompaniment of deafness. It may be present in almost every form of disease of the middle or internal ear, in obstruction to the Eustachian tube, and in accumulation of wax in the ex-

ternal auditory meatus. It is also met with in nervous and other forms of deafness where the ear is quite normal, and in such cases it is usually incurable. When disease of the ear is present the treatment must be directed to its removal.

TOBACCO, POISONING BY.—

Whether taken in the form of infusion or smoked or chewed, the *symptoms* of poisoning by tobacco are much the same, and consist of vertigo, nausea, vomiting, and colic. These are accompanied by a clammy state of skin, or the latter may be bathed in perspiration; diarrhœa, pallor, faintness, and trembling are also usually present, and the pulse becomes very small and weak, and the patient much collapsed. There may be tetanic cramps. The pupils become dilated and insensible, and, in fatal cases, stupor and convulsions precede death.

Post-mortem Appearances.—The odour of tobacco, if present, would be easily recognized, otherwise there would be nothing characteristic.

Treatment.—This would consist in aiding the rejection of the poison, by vomiting, &c., and in combating the collapse by the use of stimulants and strychnine, either by the mouth or by hypodermic injection (gr. $\frac{1}{2}$).

Chronic Effects.—The most important is atrophy of the optic disc producing the so-called tobacco amaurosis, but the excessive use of strong tobaccos may lead to other disorders. Epileptic fits have sometimes been clearly traced to this cause, and many cases of dyspepsia and palpitation are largely due to it. In amaurosis total abstinence from tobacco generally suffices to effect a cure, but sometimes a partial atrophy of the optic nerve remains (see OPTIC NERVE, DISEASES OF, section, Tobacco Amblyopia).

TONGUE, DISEASES OF.—The following morbid conditions of the tongue are briefly described in this article:—

1. Fur.
2. Acute Inflammation (*Glossitis*; *Hemiglossitis*).
3. Leucoma (*Leukoplakes*; *Ichthyosis*; *Psoriasis*).
4. Wandering Rash.
5. Syphilis.
6. Tubercular Ulcer.
7. Epithelioma.

For fuller information the reader is referred to works on surgery, and especially to Mr. Butlin's work on the diseases of the tongue, to which the writer is

indebted for much of the information herein contained.

1. **Fur on the Tongue.**—The condition of the tongue has always been considered of great importance as an index of the general health, particularly of the state of the digestive organs, and, although the more accurate methods of modern medicine have tended somewhat to displace it from its pre-eminence as a signal of disease, it still shares the chief place jointly with the pulse and the temperature.

The white or yellowish-white coating of fur so commonly present on the dorsum has been shown to consist chiefly of masses of minute living organisms—viz., micrococci and the bacillus subtilis; epithelial scales and the débris of food are also present, but their minor importance is proved by the fact that where the fur is thickest they are found in the smallest quantity. The fungus is attached to the filiform papillæ, the fungiform and circumvallate papillæ and the intervening spaces being seldom covered. The appearance known as “strawberry tongue” is produced by the turgid state of the vessels of the fungiform papillæ, causing them to stand out as red points, in marked contrast with the thick coating of fur on the filiform papillæ.

When the processes of the filiform papillæ over any area are temporarily destroyed, fur ceases to form there, and if the loss be permanent, as in the condition known as leucoma (*q.v.*), the surface remains afterwards free from fur.

The presence of fur, even a layer of considerable thickness, is quite consistent with health; in fact, in most individuals, the dorsum of the tongue in front of the circumvallate papillæ is furred on rising in the morning. The tongue is generally covered with fur in patients who take little or no solid food, as the movement of the tongue during mastication plays an important part in the cleansing of its surface. Any condition of debility, by lessening movement, tends to produce the same effect. In febrile disorders accompanied by prostration, in addition to the above factors, the mouth is often kept open, and this, with the increased temperature, tends to produce dryness of the surface of the mucous membrane.

To recapitulate, the essential factor in the production of fur is: (1) a growth of micro-organisms on the surface of the filiform papillæ; this is aided by (2) diminished movement of the tongue, (3) the absence of solid food from the diet, (4) any condition of debility, (5) the

febrile state, and (6) an open mouth, whereby evaporation is favoured.

Unilateral Furring.—The tongue is occasionally found to be furred on one side and clean on the other. This condition is probably in every case due to some cause tending to restrict the movements of the affected side, which consequently fails to get properly cleansed, and not to a loss of nervous influence. Among such conditions are the presence of an ulcer or a sharp jagged edge of a decayed tooth, and loss of power of movement, as in hemiplegia.

For the appearance of the tongue in disease, which it may be observed is in very few cases sufficiently distinctive to warrant much reliance being placed upon it in forming a diagnosis, the reader is referred to the separate articles, in each of which it is described.

2. **Acute Inflammation (*Glossitis*).**—Inflammation may affect the whole of the tongue or one-half only (*Hemiglossitis*). Either form of the disease is extremely rare, but the latter especially so.

Symptoms.—The onset of glossitis is sudden; pain on movement of the tongue, followed by its complete fixation, gradually increasing swelling of the organ and profuse salivation, constituting the most prominent signs of the affection. The tongue in severe cases may attain such a size that the mouth is unable to contain it, and it protrudes. In such a condition the acts of swallowing and speech are naturally either difficult or impossible, and there may also be urgent dyspnoea. The surface of the organ becomes thickly coated with fur, and the protruded part may be dusky, dry and brown. Fever is present, but is usually moderate in degree.

Course.—The duration of the affection is, as a rule, from three to five days, when the swelling subsides, but death may occur from suppuration or gangrene of the tongue or septic pneumonia.

Pathology.—The idiopathic form, above described, is believed to be a catarrhal affection, the inflammation following on a cold. Acute inflammation may also be due to an injury, the sting of a wasp, or the effect of mercury.

Treatment.—The patient should be freely purged without delay; leeches are sometimes of service; ice to suck is useful, but the act of sucking is difficult, from the fixation of the tongue. If the swelling be extreme and there be dyspnoea or other urgent symptom, an incision about a third of an inch deep

should be made on either side of the median line. A moderate degree of bleeding is beneficial.

Hemiglossitis is a less severe affection than the foregoing, and differs from it in that a definite nodule or lump may be present in the substance of the tongue.

Treatment should be conducted on the same lines as in glossitis. Incision is rarely necessary.

3. Leucoma (*Ichthyosis; Leukoplakes; Chronic Superficial Glossitis*).—This affection is characterized by the presence of a pearly-white or bluish-white patch on the surface of the tongue.

The affection may be limited to a small area, or the whole of the dorsum may be involved. The patches present a smooth surface and an irregular outline. The papillæ are absent, and, consequently, the affected part is devoid of fur. The tissue constituting the plaques may be of almost any degree of thickness and density.

So few are the subjective sensations, that a leucoma may be present for a long time without attracting the patient's attention. When once formed, it is probably in all cases permanent. The chief importance of the condition arises from the fact that it very often precedes the appearance of epithelioma.

A leucoma is often associated with an ulcer of the mucous membrane. In the variety known as "ichthyosis" the surface of the patch is warty and the papillæ are hypertrophied.

Ætiology.—It is probable that any irritant, by setting up a chronic inflammation, may, in an individual with some predisposition the nature of which is not understood, be sufficient to produce a leucoma. The most commonly assigned causes are—smoking a pipe, some local syphilitic affection, the taking of undiluted alcoholic drinks, and the wearing of tooth-plates. The affection is rare under the age of twenty; women are but seldom affected.

Treatment has but little effect upon the condition. Alkaline solutions (pot. bicarb. gr. xx ad ʒj) may be used as a gargle or wash, or a weak solution of chromic acid (gr. v to x) may be painted on the patch. All sources of local irritation should be removed, and smoking forbidden. The diet should be such as gives rise to the least possible irritation of the tongue whilst the food is in the mouth.

4. Wandering Rash (*Geographical Tongue*).—This is a rare affection, usually met with in children below the age of

six years, and characterized by the presence on the dorsum of the tongue, generally near the tip, of smooth red patches, at first of small size, but which gradually enlarge, and form rings with yellowish, raised, sharply defined borders, but smooth and red within. Adjacent rings may intersect, and small rings may form within larger ones. Itching and salivation are the only subjective symptoms which have been noticed, and these in a very few cases only, none being present as a rule.

The affection may remain uncured for years, but fluctuates much, eventually undergoing spontaneous cure. Its nature is obscure; the only microscopical examination made appears to show that it is "a sub-acute inflammation of the derma of the mucous membrane," probably due to some nervous influence.

No *treatment* appears to be of much avail, but tonics, such as iron and cod-liver oil, may be of some service in improving the general health.

5. Syphilis.—*Primary syphilis* is very rarely seen; it appears as a hard, circumscribed, projecting sore situated on or near the tip of the tongue. It is usually small, equal in size to a pea or larger, and painless. The lymphatic glands below the angle of the jaw may be enlarged.

Secondary syphilis affects the tongue in the form of cracks, furrows, fissures and mucous patches,—or tubercles may break down and form ulcers. Mucous tubercles are generally multiple, and, when most typical, appear as rounded or oval, raised, and well-defined patches, with irregular border, and are of a greyish-white colour.

The surface may be either smooth, or warty, or ulcerated and hollowed out. Mucous tubercles are generally painful, and may persist for long periods.

Treatment must be constitutional and local. The latter only need be referred to here. The sore places should be painted three or four times daily with a solution of chromic acid (gr. x ad ʒj). Under this combined treatment, as a rule, they rapidly heal. Smoking should be given up, and alcohol taken in moderation only. Pain may be relieved by the application of a solution of cocaine (10 per cent.).

Tertiary syphilis causes ulcers which are much more serious than those which accompany the secondary manifestations of the disease. They are usually due to the softening of *gummata*. These latter may occur on the surface or as nodules

in the substance of the organ, and may be either single or multiple. When they break down they form fissures and deep furrows, and eventually cause much puckering and scarring. Gummata are more common in men than in women, and are rare in early life, although they have been met with in congenital syphilis.

Treatment.—If the gumma has not broken down, only constitutional treatment is required; but if there be an ulcer or any one of the various sores already described, it should be treated by painting four times daily with a solution of chromic acid (gr. x ad ʒj).

6. Tubercular Ulcers.—The statement that ulcers of tubercular origin are sometimes primary on the tongue appears to be made on the ground that in some cases no physical signs could be detected on examination of the lungs—a most fallacious test. There is, however, no reason why primary tuberculosis of the tongue should not occasionally occur, although it is undoubtedly in most cases secondary to similar disease of the lungs or larynx.

The affection was first described in 1858 by Sir James Paget, and fresh attention has of late been drawn to the occurrence in phthisis of these ulcers on the tongue and in the mouth.

The ulcers present a pale, yellowish-grey, granular surface, often covered with mucus; the edges are either bevelled or sharp cut, but are rarely undermined. Induration of the surrounding tissue is slight or absent, but, as a rule, there is some swelling. The ulcer is at first superficial, but subsequently increases in depth, and may lay bare the muscle. The tubercle bacillus has been found in the discharge from such ulcers and post-mortem in sections through the base. The ulcers are in the greater number of cases due to the passage over the tongue of the discharges from pulmonary cavities or laryngeal ulcers.

The *prognosis* is, as a rule, very unfavourable, but healing occasionally occurs.

Treatment.—The ulcers which appear to be primary and are still of small size may be excised, but in the majority of cases no operation is advisable, and, if there be severe pain, the surface of the ulcer may be gently brushed over with a solution of cocaine (10 per cent.). If this be done shortly before a meal, the patient is often able to take food without pain. All sources of irritation should be removed, and a powder composed of

iodoform in fine powder (gr. j), morphine (gr. $\frac{1}{2}$ – $\frac{1}{4}$), and borax (gr. iij) may be blown upon the surface of the ulcer.

7. Epithelioma.—This is practically the only form of cancer met with in the tongue. The disease is of very rare occurrence in females at all ages, and in males up to twenty-nine or thirty years.

Any part of the organ may be attacked, but the anterior half is more often affected than the posterior, and the edge than the dorsum. The disease is often preceded by other lesions occupying the same site; of these, ulcers, either syphilitic or non-syphilitic, ichtylosis and leucoma are amongst the most common. The constant irritation of the tongue by a pipe or the jagged edge of a tooth often acts as the exciting cause of the disease, and patients with teeth in such a condition should be warned of the danger they are incurring.

Local Signs.—The appearances vary with the nature of the exciting cause and the previous condition of the affected part. Thus the disease may commence as a fissure, an ulcer, or a tubercle or warty growth, or as a nodule within the substance of the tongue. Ulceration is an early and constant feature. The growth is raised above the surrounding parts, and these, with the base, invariably present induration, the latter being one of the most important diagnostic features of the disease. Pain and salivation are generally present; the former may be severe. The cervical glands are usually enlarged.

Diagnosis.—Syphilitic lesions and warty growths may closely simulate a carcinoma, but the latter is distinguished by a greater degree of firmness, its gradual increase in size, ulcerated surface, and the progressive induration of the base.

Course.—If the growth is not excised it gradually extends to the neighbouring parts; the floor of the mouth, the gum, the lower jaw, the root of the tongue, the epiglottis, larynx and palate may be in turn attacked and destroyed. Death occurs, as a rule, within eighteen months of the first appearance of the disease, from exhaustion, septic pneumonia or hæmorrhage. The affection may remain local to the end, and, on the whole, general dissemination of this form of cancer is rare.

Prognosis.—This is very unfavourable; if the case be seen in the early stage and operated on the disease is very likely to recur *in loco* or elsewhere, and it then invariably proves fatal. It is estimated

that about 10 per cent. of the cases remain free from a recurrence for some years at least, and of these some are undoubtedly cured, but a rather larger proportion appear to succumb from the immediate effects of the operation.

Treatment.—So soon as the condition is diagnosed, presuming that this occurs before there is any extensive glandular infiltration, the affected portion of the tongue should be immediately removed, wide of the disease. For the details of the operation, and the various modes of effecting removal of the tongue, the reader is referred to works on surgery. When the diagnosis remains doubtful, it is very important not to apply caustics to the sore or to irritate it in any way.

J. K. FOWLER.

TONICS are substances which improve the tone of a part or of the whole of the body. They brace up, so to speak, the relaxed tissues. They are divided into nervine, vascular, cardiac, blood and gastric tonics according to the organ upon which they are supposed chiefly to act, but the distinctions must not be adhered to too rigidly, as it is evident that anything which improves the quality of the blood, will through it have an immediate effect on every organ and tissue throughout the body. Cod-liver oil and iron salts are the chief blood tonics, the mineral acids and alkalies the chief gastric tonics, nux vomica, strychnine and arsenic the chief nervine tonics. None of these, however, act on one part of the system only, but in varying degrees on all parts.

TONSILLITIS (Quinsy).—Inflammation of the tonsils.

The disease may involve the whole substance of the gland (*parenchymatous tonsillitis* or *quinsy*), or be chiefly confined to the lacunæ on the surface of the tonsil (*follicular tonsillitis*).

Symptoms.—Clinically the two forms are so interwoven that it will be convenient to describe them together. The attack usually comes on with febrile disturbance, malaise and aching in the limbs. Stiffness in the neck and pain in the throat soon supervene; the pain shoots up into the ears and is increased on opening the mouth or attempting to swallow. There is a constant desire to swallow, but the difficulty in doing this is so great that the secretions dribble out of the mouth, and if fluids are taken they frequently return by the nose. The tongue is coated and the breath is offen-

sive. The voice is thick and nasal, there is often deafness, the patient snores when asleep and the breathing is sometimes noisy even when he is awake. In quinsy the above symptoms attain their maximum just before the pus is evacuated, and the patient may suffer excruciating pain. On examining the throat in a case of parenchymatous tonsillitis, the tonsil (usually only one is affected) and adjacent parts will be found greatly swollen, of a deep purple-red colour, and often coated with viscid mucus. In the follicular variety, which is usually bilateral, the tonsils will be found enlarged and the surface dotted over with yellowish creamy spots, due to retention of secretion in the lacunæ.

The following complications have been met with, though fortunately only rarely, in connection with an attack of tonsillitis, viz., otitis media, cardiac disease (either endo- or peri-cardial), acute rheumatism and bronchitis. Occasionally a trace of albumen is present in the urine, but only in cases where there is considerable elevation of temperature (Haig-Brown).

Diagnosis.—This is easily made as regards quinsy; but there is sometimes a difficulty in distinguishing between follicular tonsillitis and diphtheria; in fact, there are transition forms in which differentiation is impossible. In diphtheria the patches are of an ashy-grey colour, cover a larger area, and are not dotted about as in follicular tonsillitis, and leave a bleeding surface on attempt at removal. Moreover, the onset of diphtheria is more insidious, the temperature as a rule is not so high, and albuminuria is generally present.

Prognosis.—Recovery is the termination which may be confidently looked for in quinsy; death has, however, occurred in a few cases from the bursting of the abscess, and the entrance of the pus into the larynx causing suffocation.

Pathology.—In parenchymatous tonsillitis there is an inflammation of the substance of the gland, which may go on to suppuration. In the follicular form the inflammation is more superficial, and chiefly affects the little lacunæ or crypts due to the involution of the mucous membrane. The creamy exudation seen in the lacunæ consists of fibrinous lymph, epithelial cells, and *débris*.

Etiology.—Tonsillitis is essentially a disease of adolescence and early adult life, being rare before fifteen or after thirty. Great stress has recently been laid on the connection between rheuma-

tism and tonsillitis, and there can be no doubt that the same causes are operative in the production of these diseases, exposure to cold and damp being the most common exciting causes of both, while heredity also plays a part in both. Follicular tonsillitis should always suggest the possibility of septic poisoning, and there is distinct evidence in favour of the contagiousness of sore throats, even where there is no suspicion of diphtheria.

Treatment.—The treatment is the same as for acute pharyngitis (*q.v.*). The writer has recorded some cases in which the application of a 20 per cent. solution of cocaine appeared to prevent suppuration, and, even in those cases in which an abscess formed, the application added much to the comfort of the patients by diminishing pain and enabling them to swallow. Should there be signs of suppuration, the bursting of the abscess is to be encouraged by poultices externally and the inhalation of steam, but the patient should not be left in pain when it is clear that suppuration has occurred, as immediate relief may generally be effected by puncturing the tonsil, using for this purpose a bistoury protected by strapping except for an inch at the end, and taking care to cut upwards and inwards. The previous application of cocaine will diminish the pain of the incision and facilitate the operation. Bleeding is to be encouraged by washing the mouth out with hot water.

F. DE HAVILLAND HALL.

TONSILS, HYPERTROPHY OF.

—Chronic enlargement of the tonsils.

Symptoms.—The child—for it is in children that the symptoms are most marked—breathes with the mouth open and has consequently a vacant expression, which is increased if, as is often the case, deafness be also present. The deafness is usually due to catarrhal thickening of the mucous membrane of the Eustachian tube. The breathing is laboured, and when asleep the child snores. The face is long and the nose narrow and contracted. The mouth is generally open and the lower lip everted, there is as a rule some fulness of the neck about the angle of the jaw. The patient has an unhealthy aspect and is often listless, and has a thick and nasal voice. Owing to the difficulty in breathing the chest is pigeon-breasted; this is especially apt to be the case if, as often happens, the child be rickety. The cervical glands are almost invariably enlarged.

It is unnecessary to describe the appearance of the tonsils on making an oral examination.

Diagnosis.—One glance at the throat will suffice for this purpose.

Prognosis.—In advising the removal of the tonsils it is well not to give too certain a prognosis as to the effect of the operation, on account of the possibility of the co-existence of adenoid vegetations in the naso-pharynx; if this be the case the removal of the tonsils will not suffice to cure the patient of his symptoms, as the naso-pharynx will require to be cleared ere the patient can breathe freely. With this proviso there is, in the writer's experience, hardly any operation which yields more certain and satisfactory results than the removal of greatly enlarged tonsils, and all ideas as to possible injury of the voice or interference with the sexual function may be dismissed as groundless. Moreover, in recommending the removal of tonsils it should be clearly pointed out to parents the risk children suffering from enlarged tonsils run in the event of their being attacked by scarlet fever or diphtheria.

Pathology.—There is a true hypertrophy of all the tissues of the tonsils, but the proportion varies in different cases.

Etiology.—Nothing can be definitely said on this point except that there is a strong hereditary tendency to this condition; by some writers enlargement of the tonsils is attributed to struma; not unfrequently it seems to follow upon repeated slight attacks of tonsillitis.

Treatment.—If the tonsils are sufficiently enlarged to interfere with the breathing, especially if the chest is becoming affected, they should be removed, and for this purpose Morell Mackenzie's modification of Physick's guillotine is recommended. It is advisable not to remove them when they are inflamed. The only remedy, short of excision, which promises any success is the use of the galvano-cautery, the tonsil being made to contract through the cicatrization brought about by puncturing it with a fine galvano-caustic point. In less-marked cases painting the tonsils nightly for some months with an application composed of equal parts of tincture of iodine, tincture of catechu and glycerine, together with the internal administration of cod-liver oil, syrup of the iodide of iron, and residence at the seaside may succeed in preventing further enlargement and may even cause some diminution in the size of the tonsils.

F. DE HAVILLAND HALL.

TORTICOLLIS (Wry-neck and Spasmodic Wry-neck).—A spasmodic affection of one or more muscles of the neck, and mainly of those supplied by the external branch of the spinal accessory nerve.

The affection may be unilateral or bilateral, and the spasm tonic or clonic.

Symptoms.—It is convenient to describe the two varieties of wry-neck separately.

(1) *Tonic Spasm, usually limited to one Sterno-mastoid Muscle.*—In this case the occiput is drawn towards the shoulder of the affected side, the face rotated towards the opposite shoulder, the chin raised, and the head thrown forwards. The trapezius is sometimes the seat of spasm. When the clavicular part is involved, the head is drawn to the affected side, the occiput approximated to the shoulder, the face rotated to the opposite side. The other portions of the trapezius may be implicated, and hence the shoulder is raised, and the scapula drawn slightly inwards. The sterno-mastoid and trapezius may be involved separately or simultaneously. The affected muscles become rigid and prominent, and after the lapse of time the deformity cannot be rectified either by passive efforts or voluntary action. In old-standing cases the cervical part of the spinal column becomes curved, the convexity being towards the sound side. Tonic spasm of both sterno-mastoid muscles is very exceptional. When it occurs, the head is drawn forwards, and the chin depressed.

(2) *The Clonic or Spasmodic Variety of Torticollis.*—This form of the disease is often preceded by uneasiness or pain about the neck. Jerking of the head soon follows, which at first may be restrained or rectified by voluntary effort. During sleep, and when the head and neck are mechanically fixed, the spasms are arrested. On the other hand, mental excitement, fatigue and ill-health exaggerate the movements. The clonic spasms come on at variable intervals. At an early stage the intermissions are comparatively long; but later on they are of shorter and shorter duration, until the spasms are almost continuous. The head and neck now become permanently distorted, the clonic movements, though of less amplitude, still persisting. As in the tonic form of wry-neck, the sterno-mastoid is frequently affected, with coincident or alternating spasm of the trapezius. The movements resulting from the contraction of these muscles have already been

described. Very often there is associated clonic spasm of the splenius and obliquus capitis, which are innervated by the superior cervical nerve. In some cases movements of the face, of the jaw, and of the various segments of the upper limb, supervene. The muscles of the neck are usually involved unilaterally, but sometimes the movements are bilateral, and then the spasm may be either alternating or simultaneous.

In *eclampsia nutans* (nodding spasm or salaam convulsion) of young children, the head and upper part of the body are bowed forwards several times in succession. The attacks tend to occur in paroxysms, during which the child may suffer temporarily from disordered consciousness. With this variety may be mentioned the unilateral head-jerking, from movement of the sterno-mastoid and of the rotating muscles of the head, which is also occasionally observed in children at the time of the first dentition. The movements are intermittent, often recur on attempts at fixation of an object, and are very commonly accompanied by lateral or oscillatory nystagmus. Momentary loss of consciousness is sometimes present in these cases.

In the ordinary adult form of spasmodic wry-neck the irritability of the affected muscles to the faradic current is said to be increased. Sometimes the movements are arrested by pressure on the muscles or on the supplying nerves.

Diagnosis.—Tonic spasm of the muscles of the neck may accompany spinal caries, but in such cases spinal tenderness is often found, and sometimes angular curvature. In the early stage of caries, however, muscular rigidity may be the only appreciable symptom. The common stiff neck, resulting from exposure to cold, is usually associated with local pain, and its duration is short. Spasm of the muscles on one side of the neck may occur when their antagonists are paralysed, but in this affection passive movements may be freely executed.

Prognosis.—Though sometimes amenable to treatment, spasmodic wry-neck has a marked tendency to recur. The general health may become impaired in severe cases. The nodding and lateral spasm in children often disappears, but relapses are frequent. Sometimes, however, convulsions and mental deterioration ensue.

Morbid Anatomy and Pathology.—It is highly probable that torticollis belongs to the so-called "functional" class of

disease. At any rate, no gross lesion has yet been discovered. Reflex irritation, especially in children, is occasionally present.

Etiology.—The causes of the disease are obscure. Both sexes are liable to be attacked, and the ordinary form of spasmodic torticollis occurs mainly in early or middle adult life. Emotional disturbance sometimes precedes the disease, and in some instances the individuals attacked are of hysterical stock or disposition. Over-exertion, exposure, and excesses have been looked upon as exciting agents.

Treatment.—In the tonic form division of the muscle or tendons is often effectual. Subsequently the head must be maintained in the normal position, by some form of mechanical apparatus. In spasmodic torticollis, various remedies have been suggested, such as bromide of potassium, belladonna, cannabis indica, antipyrin, sulphate of zinc, and morphine. The last named drug should, on obvious grounds, be used with great caution. The dose of many of the remedies above mentioned ought to be increased gradually, and it is often desirable to push the drug until the physiological effect is produced. The cold shower-bath is sometimes of service. Blisters to the affected muscles or in the course of the nerve are sometimes followed by temporary relief. The continuous current locally applied, and the use of the faradic current to the antagonistic muscles, have been recommended. Dr. Ross records a case in which marked benefit followed the use of an apparatus which caused permanent pressure on the "point of arrest." Stretching and division of the nerve, excision of a portion of nerve, and myotomy have been employed with a varying degree of success. Such operative measures should only be resorted to when the case is of long-standing, and has resisted other means. Surgical interference is also contra-indicated when there are movements of other parts, such as the face and arms. Mechanical means to restrain the movements of the head have been used, but they are of doubtful advantage.

W. B. HADDEN.

TOUCH, DISORDERS OF (including **MUSCULAR SENSE**).—Under this heading are included all the varieties of sensibility other than the special senses—viz., tactile sensibility, sensibility to pain, sensibility to temperature, and muscular sensibility.

Tactile Sensibility.—This may be

either altered in character (paræsthesia) or lost (anæsthesia). The tactile sensibility is rarely, if ever, excessive (hyperæsthesia), but, if the sensory nerves be in a condition of irritability, a slight touch may give rise to pain, and to this condition the term "hyperæsthesia" is commonly applied in preference to the term "hyperalgesia." When the time which elapses before a stimulus, applied over a certain area is perceived is longer than on the corresponding part, sensibility is said to be delayed. Tactile sensibility may be tested by touching the part lightly with a pen, the patient's eyes being closed, or by the use of the "æsthesiometer," an instrument for ascertaining at how short a distance apart two points can be differentiated. As a rule, the simple method first mentioned gives satisfactory results.

Sensibility to Pain.—This form of sensibility may be affected together with or independently of the last-named variety. When lost, the condition is properly termed "analgesia," but the term "anæsthesia" is more often employed. As already stated, the same remark applies to the terms used to denote an increased sensibility to pain. Sensibility to pain, like tactile sensibility, may be delayed. The condition of sensibility with regard to pain may be tested by pricking or pinching the part, or a faradic current may be used.

Sensibility to Temperature.—The appreciation of differences of temperature may be affected with the varieties of sensibility already mentioned or independently, and it is also believed that the sensations of heat and cold are conveyed by different nerves. The impairment of this sense may vary from a difficulty in recognizing slight differences in temperature up to a point where such stimuli pass quite unperceived.

The usual method of testing sensibility to temperature is by the use of sponges from hot and cold water or heated and cold metal spoons.

These various forms of sensibility may be either impaired, lost, over-active or disordered owing to lesions situated in (a) the peripheral nerve, including its terminal organ, (b) the spinal cord, or (c) the brain.

(a) *Peripheral Lesions.*—The fact that after complete division of a nerve there is in some rare cases no loss of tactile sensibility is generally explained by assuming that in such individuals an unusually free nervous anastomosis exists. In cases of injury or disease the peripheral nerves remain capable of conduct-

ing sensory impressions long after motor impulses have ceased to pass, a very few healthy fibres being apparently sufficient to convey sensory stimuli. Loss of tactile sensibility is a marked symptom in all forms of peripheral neuritis (*q.v.*) and also in the anæsthetic variety of leprosy (*q.v.*), and under various circumstances from pressure upon nerves. Irritative lesions of nerves may produce hyperæsthesia and pain in the area of distribution of the affected nerve.

Spinal Lesions.—For the effect of partial and total transverse lesions of the spinal cord, the reader is referred to the article SPINAL CORD, ANATOMY AND PHYSIOLOGY OF.

Loss of sensibility in spinal lesions is usually bilateral, but is always situated on the side of the body opposite to the lesion of the cord.

The posterior median and the anterior portion of the lateral white columns, or antero-lateral ascending tract, are probably the chief conducting strands for sensory impressions, and it is believed that the former are mainly concerned in the transmission of tactile impressions and the latter of sensations of pain.

The path by which impressions of temperature are conveyed through the cord is unknown, but it is probably situated in the lateral columns with that conducting sensibility to pain.

Increased sensitiveness is more often found in association with lesions of the spinal meninges than of the cord itself, whilst sensation may be abolished by lesions involving the posterior roots.

There are a great number of diseases in which, owing to lesions of the spinal cord, these various senses are affected, the most important being compression of the cord, as from tumours or hæmorrhage, or in any other way; and in the various forms of myelitis and spinal sclerosis, especially locomotor ataxia.

The mere enumeration of these affections is here sufficient, as the condition of the sensory perceptions is described in the separate articles, which will be found under the appropriate headings.

(c) *Cerebral Lesions.*—In cerebral lesions, owing to the decussation of the sensory fibres in the cord, the side of the body affected is opposite to that of the lesion. As a rule, in cerebral lesions the loss of sensibility, although affecting a larger area, often exactly one-half of the body, is less complete than in spinal and peripheral lesions. Sensory impressions are probably conveyed through the upper part, or tegmentum, of the pons and cura,

thence through the posterior third of the hinder limb of the internal capsule and the corona radiata, to the cortex in the central and parietal regions.

Hemianæsthesia may be produced by a lesion situated anywhere in the sensory path. In the case of a tumour situated in the pons, the loss of sensibility may affect both sides of the body. Hemianæsthesia rarely occurs from disease of the cortex, but there is often some impairment of sensibility in such cases. As a rule, the loss of tactile sensibility is most marked in the extremities of the affected limbs.

In typical cases of hemianæsthesia the loss of sensibility affects the head, trunk, extremities and mucous membranes on the side opposite to the cerebral lesion, sensibility to pain and touch being lost either separately or in association. In such cases the special senses are often affected also (*see* BRAIN, FUNCTIONS OF).

A condition somewhat similar to the above is met with in neurotic subjects—hysterical hemianæsthesia; in this the muscular sense is also lost, and, as a rule, ovarian pain is present (*see* HYSTERIA).

Irritant cerebral lesions may give rise to various paræsthesiæ.

MUSCULAR SENSE.—This may be defined as the knowledge of the degree of muscular contraction, *i.e.*, of how much force a given muscle is exerting. It also includes the ordinary sensibility of the muscles to pain and pressure, but it is commonly used in connection with the first-mentioned and more striking form of sensibility. The power of estimating differences in weight and the knowledge of the position of a limb are intimately bound up with the sense of degree of muscular contraction, and are lost when that sense is in abeyance.

This sense may be tested in various ways. The patient's eyes being closed, his arm is placed in a certain position, which he is asked to describe or imitate; two glasses, one full of water, the other empty, may be allowed to rest upon the end of corresponding fingers of the two hands, or balls of equal size but of different weight may be placed in the hands, or bags containing different weights may be hung on to the fingers, and the patient be asked to state which is the heavier.

The fibres conveying the muscular sense do not decussate in the cord, consequently, the muscular sense is lost on the same side as the lesion. The path of these fibres is possibly in the posterior median columns, and it is also

considered possible that the posterior vesicular tract and the direct cerebellar tract may convey sensory impressions from the muscles of the lower part of the trunk.

As already stated, the muscular sense may be lost in hysterical hemianæsthesia, whilst anæsthesia of the muscles may be present in locomotor ataxia and in hysteria. If the loss be sudden, the affection is probably spinal in origin. The treatment depends entirely upon the nature of the underlying cause.

J. K. FOWLER.

TRACHEA, FOREIGN BODIES IN.—A foreign body may enter the trachea and cause sudden death from obstruction if sufficiently large to occlude the air tube, if of smaller size it may cause dyspnoea and symptoms of irritation.

Treatment.—Tracheotomy should be performed at once, and not unfrequently the foreign body is speedily expelled either through the glottis or through the opening, if this does not happen inversion may be tried or forceps may be cautiously used.

F. DE HAVILLAND HALL.

TRACHEA, INFLAMMATION OF.—Inflammation of the trachea may be either acute or chronic.

ACUTE TRACHEITIS.—Acute catarrhal inflammation of the trachea is almost always the result of extension from the larynx or bronchi, it may, however, be the primary affection. In such a case the voice will not be affected, tenderness may be felt along the course of the trachea, with pain on coughing, and the patient may experience pain on swallowing, as the bolus of food passes down the œsophagus. By the aid of the laryngoscope the congested condition of the mucous membrane may be recognized in a certain proportion of the cases, but a tolerant patient and an excellent light are required to make a satisfactory tracheoscopic examination.

Prognosis.—If the inflammation be limited to the trachea no danger need be apprehended.

The *etiology* and *treatment* of acute tracheitis are practically the same as for acute laryngitis.

CHRONIC TRACHEITIS may be the sequel of an acute attack; it generally occurs as a result of chronic laryngitis or chronic bronchitis. The *treatment* is the same as for the bronchitic affection.

F. DE HAVILLAND HALL.

TRACHEA, STENOSIS OF.—Narrowing of the trachea.

Symptoms.—There is dyspnoea, but it is unaccompanied by the up and down movements of the larynx which are observed when the obstruction is seated at the glottis. The breathing is attended by stridor and the respiratory sounds are masked by the tracheal sound. The voice is usually weak though clear. Semon has recorded a remarkable case of stenosis of the trachea of syphilitic origin in which there was inspiratory dyspnoea, free expiration and normal voice, a combination suggestive of bilateral paralysis of the abductors, but distinguished from it by the absence of the respiratory excursions of the larynx.

Diagnosis.—Laryngoscopic examination will usually suffice to distinguish tracheal from laryngeal obstruction, but unless the cause of the mischief can be seen in the trachea, it is often extremely difficult to say whether the obstruction is situated within or without the trachea.

Prognosis.—In all cases this is grave; the stenosis being so frequently of a cicatricial character has a tendency to increase, and if seated low down, mechanical treatment may be difficult or even impossible.

Pathology.—The stenosis may be brought about by (1) pressure from without; (2) disease of the tracheal wall; (3) the implication of the trachea in disease of neighbouring parts. Enlargement of the thyroid, aneurysm and mediastinal tumours are the chief causes of the first group. In the second class cicatricial contraction due to syphilis plays the most important part, in fact the great majority of cases of stenosis are of this nature. Granulation tumours due to the irritation of the cannula after tracheotomy, new growths—*e.g.*, cancer, occasionally lead to stenosis. In the third class cancer of the œsophagus may in its onward growth implicate the trachea and cause a diminution in its lumen.

Treatment.—Unless syphilis can be absolutely excluded the patient should be placed on an anti-syphilitic treatment immediately upon the supervention of symptoms of tracheal stenosis—*i.e.*, half a drachm of blue ointment must be rubbed in daily, and ten to twenty grains of the iodide of potassium given every six hours. In chronic cases attempts may be made to dilate the trachea either through the larynx, or after the operation of tracheotomy.

F. DE HAVILLAND HALL.

TRACHEA, TUMOURS OF.—

A. NON-MALIGNANT.—New growths are not nearly so frequently met with in the trachea as in the larynx, in fact they are of rare occurrence.

Symptoms.—Dyspnœa is the chief symptom, the degree depending on the size of the tumour. As in other instances of tracheal obstruction dyspnœa is unaccompanied by respiratory excursions of the larynx. In some cases the tumours may be seen by tracheoscopy.

Treatment.—In a few instances the tumours have been removed *per vias naturales*; if this cannot be effected the trachea must be opened in a vertical direction so as to gain access to the tumour.

B. MALIGNANT.—Primary carcinoma of the trachea is exceedingly rare. Up to the end of 1887 only thirteen cases had been placed on record.

Dyspnœa is the chief symptom, but a diagnosis can only be made if the growth can be seen by the aid of the laryngoscope.

Tracheotomy will prolong life unless the growth extend too low down to admit of its being performed.

F. DE HAVILLAND HALL.

TRACHELORRAPHY (Emmet's Operation).—An operation devised by Dr. T. A. Emmet, of New York, for the repair of the lacerations of the cervix, which occur in most women who have had children. When this operation was first introduced, it was asserted that almost every disease to which women are subject was produced by these lacerations, and that therefore their repair was a necessary step to successful treatment. No proof has ever been adduced either of the effects on health which these lacerations have been stated to produce or of the benefits stated to result from the operation; but there is a good deal of testimony that in some cases not benefited by other means relief has followed repair of the cervix, and therefore it may be proper in cases of chronic inflammation of the cervix with laceration, if other treatment fail, to repair the cervix. But at present we have no criteria by which to identify these cases beyond the failure of other treatment. It is quite certain that the enormous majority of cervical lacerations interfere in no way with convalescence after labour or with subsequent health, comfort, and fertility, and that, if the operation of trachelorrhaphy be done in every case in

which laceration co-exists with illness, in the vast majority of cases it will fail to improve health. G. E. HERMAN.

TRANCE.—Trance in its ordinary sense is a term of somewhat vague limits, but had best perhaps, in strict medical language, be confined to a prolonged and rare condition of abnormal sleep which is produced by no known external agency, is generally entirely passive, in which the vital functions are reduced to an abnormally low minimum, and from which the entranced patients cannot be aroused by such ordinary excitants as would be more than sufficient to wake them from normal sleep. They can assimilate food artificially given, and may remain in this trance condition for as long as twenty-three weeks (Gairdner) or even for a year (P. Richer). Braid made a careful collection of Indian cases in which the fakirs induced in themselves a trance condition of extreme lethargy in which they were able to remain ten days or more without either food or drink (Sir Claude Wade, Sir C. Trevelyan). This tends to show a certain power of the will in the matter, and a greater adaptability of the Oriental mind and body to the conditions.

The onset of such a condition is usually sudden, and the awakening from it also rapid, though not to such an extent as to startle the person who has been in trance.

The symptoms are almost entirely negative. There is an absence, complete or incomplete, of sensation, and in a less degree of motion and of deep and superficial muscular reflexes. The breathing becomes nearly imperceptible; it may even be impossible to see any cloud on a clear mirror held before the mouth; the respiratory movements may be imperceptible, or at least as infrequent as three in two minutes; the pulse and action of the heart may be impalpable, though the condition of the retina will show that very slow circulation is still being kept up. The temperature is low, but has not been observed below 97° F. There is sometimes pallor, but very rarely that cadaveric appearance which once led Vesalius to mistake trance for death. Any such question of diagnosis can be settled by the electrical reactions of the muscles.

The condition in its physical signs is as a rule very like that of a hibernating animal. But the physical signs are variable; in fact, there are few cases in which they are all present at the same time. There may be, for instance, nearly

normal pulse and respiration and normal sensation or even hyperæsthesia.

The condition in itself is not one of any danger under careful supervision and treatment by food and warmth, but it may be almost indistinguishable, except by its history, from one of so-called spontaneous somnambulism arising in a hysterical subject, which generally implies an obstinate type of hysteria.

With the *psychical conditions and relationships* of trance we are at present very imperfectly acquainted. It needs careful study in company with a large group of cognate mental abnormalities. As a rule, the mental state is passive, and no memory of it persists; but there are insensible grades between this and ecstasy in which there is mental concentration on perceptions, sometimes supernormal, with outward expression of this, and more or less subsequent recollection. On the other hand, though the mental state in trance is generally quite unaffected by its surroundings, there are intermediate states between this and self-induced hypnotism, or auto-hypnotism, in which, with almost the same physical signs, there may be a very remarkable *rapprochement* with other people and notable receptivity to slight external stimuli.

A. T. MYERS.

TRANSFUSION (and INFUSION).—By these terms are meant the operations by which blood or some saline solution is injected into the blood-vessels of a living animal by artificial means. In medicine transfusion has been performed in various kinds of cases, such as (1) where there has been great loss of blood after operation or parturition, (2) where there has been excessive drain of the fluid constituents of the blood, as in cholera, (3) in diabetes, (4) where there has been profound alteration in the blood itself from various causes, such as occurs in leukæmia, anæmia, pyæmia, or the acute specific fevers.

Of recent years the opinion has been gaining ground that the value of "blood," as such to the person into whose vessels it is injected is less than was originally supposed and that much, if not all, the benefit claimed for it can equally be claimed for some simple saline solution. This latter acts by increasing the quantity of fluid in the vascular system and by enabling the circulation to be maintained when, for some cause or other, it had practically come to a standstill.

It has been ascertained by experiment that even after syncope has occurred, suffi-

cient corpuscular elements are left in the vascular system to carry on the function of the blood if only some harmless fluid be poured into the circulation. Various substitutes for human blood have been suggested, such as milk, or the defibrinated blood of some mammal whose corpuscles are smaller than man, such as the sheep. Not only have these no superiority to simple saline solution, but they are in some cases positively harmful.

Two methods only will here be considered. First, the injection of blood, either mediately or intermediately; and secondly, the injection of normal salt solution (0.75 per cent. solution of chloride of sodium in distilled water at 98° F).

Many ingenious forms of apparatus have been invented, but they are not here described, as those who possess them should know how to use them, and none of them have any superiority in skilled hands over the simplest apparatus which is in the possession of every surgeon. The best known forms of apparatus are those of Aveling (*Obst. Trans.*, 1873) and Roussell ("Transfusion of Human Blood," London, J. & A. Churchill, 1877). The former is practically a Higginson syringe with stop-cocks instead of valves at either end. The latter is an attempt to provide a mechanical substitute for surgical skill, and does not seem to be in any way necessary for the safe and easy performance of the operation.

The whole question of transfusion from a pathological, physiological, and practical point of view is discussed ably and at length in Dr. W. Hunter's lectures on Transfusion, reported in the *British Medical Journal* (vol. ii. 1889). His experiments show that in the great majority of cases the infusion of normal saline solution is attended with equally satisfactory results, and accompanied by far less danger than the injection of blood, whether defibrinated or not. The nutritive value of blood when injected into the circulation is very small; any advantage from its use seeming to depend more upon its physical than its physiological character, and considering the difficulty of keeping in order any particular form of apparatus for the mediate or intermediate transfusion of blood, the injection of saline solution should receive the preference in cases of emergency, such as hæmorrhage after confinement, diabetic coma, or choleraic collapse.

In order to perform the operation it is only necessary to open some moderate-sized vein, to insert a small cannula and attach to it a few inches of india-rubber

tubing filled with the saline solution. To the end of this tube a small glass funnel is attached, so that the requisite amount of fluid can be allowed to pour into the vessel by the force of gravitation. The quantity injected must of necessity vary very much according to the size of the patient, the extent of the loss of blood, and the effect produced by the injection. Probably not more than a pint would in any case be required.

Professor Schäfer (*Trans. Obstetrical Society*, vol. xxi., 1879) has published a series of experiments on the direct transfusion of blood from vein to vein or artery to artery.

In order to perform the former of these operations it is only necessary to insert one cannula into the vein in the arm of the donor and another into the vein in the arm of the recipient, connecting the two by a small tube of india-rubber which has been filled with bicarbonate of soda solution to prevent the coagulation of the blood.

In direct transfusion from artery to artery, it is suggested that the dorsal artery of the foot in the donor should be opened, and that during the operation he should stand, by which means the highest pressure of blood is made available. If the dorsal artery of the foot in the recipient cannot be found, owing to its not being filled with blood, it is desirable that the left radial should be opened, the cannula in any case being made to point towards the heart. It is in some cases easier to practise the intermediate operation, that is to say, to receive the blood of the donor in a glass vessel, to mix it with solution of phosphate of soda to prevent coagulation, and then to inject it into some vein of the recipient.

Dr. J. Duncan has discussed this question in the *Transactions of the Edinburgh Medico-Chirurgical Society*, 1885-86, and he recommends that a solution of 5 per cent. of phosphate of soda should be added in the proportion of 1 part to every 2 of blood.

In performing this operation the most scrupulous precautions must be taken to render the apparatus aseptic. If this be done, it is almost as simple as the injection of the saline solution.

The blood from the donor to the amount of from 8-15 oz. should be received in a small glass beaker containing the required amount of phosphate of soda solution, which must be kept at the normal temperature of the body by being immersed in hot water. A small cannula of glass with 2 inches of india-rubber

tubing attached, after being filled with phosphate of soda solution, should be inserted into the selected vein of the recipient. The blood may then easily be injected with a simple glass syringe, whose nozzle fits into the india-rubber tube. Care should be taken to avoid the entrance of any bubbles of air, though this source of danger has been very much exaggerated. The whole apparatus may be kept warm with flannel wrung out in some hot antiseptic solution. It is necessary to perform the injection very slowly. As much as 16 oz. have been injected in this manner with very satisfactory results. If excess of phosphate of soda be used, violent pain, chiefly in the back, may be induced; and if the operation be performed too rapidly over-action of the heart may make it necessary to desist, but if the details are attended to there is little fear of either of these complications. In all cases it is desirable before attempting to insert the cannula that the vessel should be carefully dissected out, as it is often not easy to find owing to its being empty or only partially filled with blood.

Dr. Roussell has published fifty cases of transfusion, twenty-seven of which were successful, and, entirely on practical grounds, he urges the use of some such apparatus as his, and the use of human blood passed directly from giver to the recipient.

Against the use of any such form of apparatus it may be urged that the operation of transfusion is only likely to be necessary in cases of extreme emergency and that any apparatus however simple is liable to get out of order unless constantly attended to: that no form of apparatus will supply want of skill on the part of the operator, and that on clinical, experimental and physiological grounds it is unnecessary to incur the risks and complications of using blood when so simple a fluid as a normal salt solution will supply all that is necessary to carry on the circulation of those cases which are not already hopeless.

The transfusion of blood in cases of anæmia and other blood disorders has not justified the hopes which were at first formed as to its value.

T. D. ACLAND.

TRANSPPOSITION OF VISCERA.—Man, in common with mammals, is distinguished from other vertebrates by the fact that the aorta arches over the root of the left lung, and passes

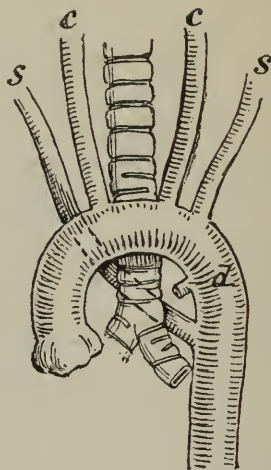
downwards on the left side of the vertebral column. Certain anatomical conditions in man are closely associated with this position of the aorta—viz., the apex of the heart is directed obliquely to the left side of the thorax, the right lung is three-lobed, the thoracic duct terminates at the junction of the left subclavian and internal jugular vein. Turning to the abdomen we find the liver occupying the right hypochondrium, its right lobe greatly exceeding in size the left; the *cul-de-sac* of the stomach lies in the left hypochondrium, and is closely related to the spleen. The transverse duodenum is directed from right to left across the body of the second lumbar vertebra, and the pancreas has its head on the right side of the abdomen and its tail in relation with the spleen. The cæcum occupies the right iliac fossa, and the vena azygos major lies on the right side of the column and terminates in the vena cava superior after arching over the root of the right lung.

It occasionally happens that the aorta arches over the root of the right lung and runs along the right side of the spine. This variation is often accompanied by a transposition of the viscera—that is to say, those organs, normally found on the right side of the thorax and abdomen respectively, take up a position on the left side, and *vice versa*. This alteration is of a most complete character, and is not merely an alteration in position, but an actual transposition, and, in order to appreciate it, the organs implicated may be separately considered.

Aorta.—The direction of this vessel is not merely the reverse of that which is normal, but the order of the vessels arising from it is reversed also: thus the left subclavian and common carotid arise from an innominate trunk, whilst the right common carotid and subclavian arteries spring directly from the arch. Among the numerous anomalies to which the trunks arising from the arch are liable, perhaps the most interesting is when the right subclavian, instead of arising from the innominate as usual, is the last vessel given off. Under such conditions it passes behind the trachea and œsophagus to gain its usual position on the first rib. So common is this that many anatomists adopt the following rule,—when the right subclavian frees itself from the innominate, it usually arises as the last vessel from the arch, and passes behind the œsophagus (Fig. 1).

When this arrangement obtains, the

FIG. 1.



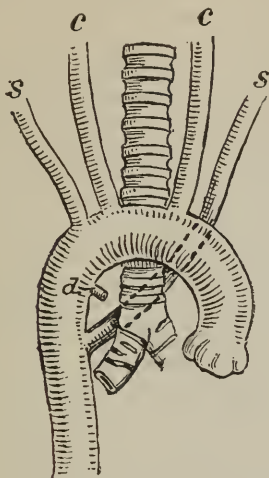
The right subclavian artery arising as the fourth branch of the aortic arch.

right inferior laryngeal nerve has often a direct instead of a recurrent course, and the thoracic duct has a dextral termination. In one carefully described case of right aortic arch the left subclavian artery, instead of coming from a left innominate, was the last vessel to arise from the arch, and then followed the course usual to this mode of origin—that is, it passed behind the œsophagus. The relation of the inferior laryngeal nerve and thoracic duct is, unfortunately, not stated. An aberrant subclavian artery of this character associated with a right aortic arch is represented in Fig. 2.

A right aortic arch with transposition of viscera must not be confounded with "transposition of the aorta." This term is used when the aorta arises from the right ventricle of a normally placed heart.

Heart.—The transposition of this organ consists, not merely in the deflection of its apex to the right instead of the left, but in an actual reversal of its cavities, the right ventricle becoming systemic and the left pulmonic. The superior and inferior venæ cavae open into the left auricle, and the major azygos vein arches over the root of the left lung to gain the superior vena cava. This displacement of the heart is frequently accompanied by imperfect development of the ventricular septum, often so extreme as to be incompatible with life.

FIG. 2.



A right aortic arch, with aberrant subclavian artery.

Lungs.—Even in cases of incomplete transposition, the left lung is furnished with three lobes and the right two; it is remarkable that a three-lobed left lung unassociated with transposition, complete or incomplete, has yet to be recorded.

Liver.—This organ is completely reversed; it not merely lies in the left instead of the right hypochondrium, but its left lobe is the larger, and is the part which accommodates the gall-bladder.

Stomach.—This is not altered in position so frequently as the preceding viscera. In typical cases the great *cul-de-sac* or fundus is directed to the right and the pylorus to the left. In individuals with the liver occupying the left hypochondrium and the stomach not transposed, it must naturally follow that this viscus cannot occupy its natural position but is pushed lower in the abdominal cavity than usual. When the stomach is transposed the direction of the duodenum is reversed also and the head of the pancreas, instead of lying on the right side of the spine, is directed to the left. Under such conditions the jejunum commences on the right side of the spine. The disposition of the various part of the duodenum is liable to considerable variation when the viscera are transposed.

Spleen.—The position of the spleen is influenced by the stomach;

when the latter organ is transposed the spleen, connected as usual with its great *cul-de-sac*, occupies the right hypochondrium. When the liver is in the left hypochondrium and the cardiac end of the stomach maintains a sinistral, though displaced position, the spleen maintains the natural relation to this viscus. When the stomach and spleen are completely transposed the latter is liable to be malformed. Even under ordinary conditions the spleen is extremely liable to be accompanied by one or more satellite spleens or spleniculi; but when it occupies the right hypochondrium it is usual to find numerous satellite spleens, and in some cases the spleen has been represented by a number of spleniculi instead of a single organ. In one case (Hickman's) nine spleniculi were counted. In another (Matthew Baillie's) five satellites were present. M'Whinnie found the spleen represented by three separate equal-sized portions in the right hypochondrium, and Curling in a similar case of transposition found the spleen on the right side "with four supernumerary spleens near the principal one." Thurnam, in reporting a case in which all the viscera except the stomach and spleen were transposed, writes:—"Behind the stomach was a round spleen, the size of a small apple, and accompanying it, were five supernumerary spleens, the size of walnuts and filberts, which grew, as it were, from the branches of the splenic artery something like a bunch of grapes."

The Cæcum and Colon.—In many of the cases in which the thoracic viscera with the liver, stomach, and spleen were transposed, the cæcum occupied the left instead of the right iliac fossa; the ascending, transverse, and descending colon took the reverse of the usual course and the rectum was on the right side of the pelvis. In others the cæcum was situated as usual in the right iliac fossa; under these conditions the ascending and descending portions of the colon were parallel to each other on the right side of the abdomen. In a few cases the cæcum was in the left iliac fossa, and the colon passed obliquely across the abdomen to the right hypochondrium and then descended to the pelvis. So vagarious is the colon when the viscera are transposed, that no positive statement can be made in regard to it, and even in cases where the stomach, duodenum, spleen, and pancreas are completely reversed, the cæcum and colon may retain a

normal position. Transposition of the cæcum and colon, independently of the remaining viscera, is by no means an unusual event. The intra-abdominal portion of the vitello-intestinal duct is unusually persistent in cases of visceral transposition.

Veins.—Many anomalies of veins, especially in regard to their terminations, have been recorded in connection with the transposition of viscera. These cannot all be considered; it is clear that if the aorta runs along the right side of the spine and the inferior cava on the left, certain alterations in the venous system are unavoidable. The chief of these are the following:—the right renal vein is longer than the left, and receives the corresponding spermatic or ovarian vein, as the case may be. It has been noticed in two cases that the right testis was lower than the left. The right iliac vein is longer than the left and the portal vein is directed to the left instead of the right side. In the thorax the right innominate vein is the longer; the dextral thoracic duct has already been mentioned. In a few carefully dissected cases the major azygos vein was situated on the left side of the spine.

The bronchial veins are liable under these conditions to vary in their mode of termination. The most remarkable variation is that recorded by Hickman, in which the pulmonary veins from the right lung entered the left auricle, and those from the left lung entered the right auricle. No symptoms which could in any way be attributed to this anomaly were observable during life.

Individuals with transposed viscera, unassociated with developmental defects of the heart, seem to be little influenced thereby. In several cases defects of the ventricular septum and anomalous terminations of the bronchial and systemic veins with concomitant cyanosis have been reported, but as these defects occur independently of transposition, they cannot in justice be attributed to it. In order to give some notion of the expectancy of life with transposed viscera the following ages of individuals with the name of the observer may be useful. Female, 28 years (Hickman); male, 40 years (Matthew Baillie); male, 48 years (Allen Thomson); male, 48 years (William Moxon; female, 25 years (M'Whinnie); female, 37 years (Thurnam); male, 40 years (Curling); and a female 85 years (Ed. Parker Young). A perusal of the history of the cases does not show that the position of the viscera had any evil

effect, in some of the cases death was due to lung trouble, and in several the heart was described as diseased and there was general dropsy.

It has often been stated that individuals with reversed viscera are left-handed, but an examination of the reports of many cases observed during life, and in a few in which this matter was inquired into after death, does not lend the least support to such a conclusion.

The cause of transposition of viscera is as unknown as the reason why the liver normally occupies the right hypochondrium and the spleen the left. Speculations as to the cause have been advanced but with little confirmatory evidence. Von Baer attempted to explain it in the following way:—In the early stages of the avian embryo, and certainly in a few mammals, the ventral aspect of the embryo lies on the yolk, but soon the left side is turned towards the yolk; occasionally embryos are found with the right side in the direction of the yolk. Von Baer believed this alteration in the position of the embryo determined the deviation in question. To say the least this suggestion is very ingenious, but when taken in consideration with such facts as the disappearance of the right omphalo-mesenteric vein and the left superior cava in man, the right oviduct in all, and the right carotid in a few species of birds, and other kindred facts, the view ceases to carry that conviction which it does when considered in relation to man alone.

Allen Thomson and others have pointed out that in double embryos produced by dichotomy of a single germ, the viscera of one or other embryo should be transposed, one should be, as it were, the reflection of the other, *velut in speculo*. The writer of this article has tested this matter, and in many instances such is indeed the case, but in the majority of specimens the heart, liver and other organs are so displaced or agglomerated, that it is impossible to decide not merely to which half of the body, but often to which foetus, they belong. This is particularly the case with the heart. The writer, too, is fully of opinion that when twins occur of the same sex, with a common amnion and single placenta, they are the product of a single ovum. This of course suggests that an individual with transposed viscera should be one of twins. Unfortunately no facts are forthcoming whereby this view may be tested, but it is one that would repay investigation. It must be carefully borne in mind,

that it does not follow that because only one child was recognized at birth, therefore only one was present. Many cases of twin-births have been recorded in which the second child was flattened out, and formed merely a small lump in the membrane, or presented itself in the form of an *acardiacus*, and the writer has known such masses to be cast aside even by obstetric physicians (who ought to have recognized them) as "mere adventitious lumps." Perhaps, now that many workers look upon teratology as something more than a science of curious deformities, in which the varieties are distinguished by sesquipedalian names, a solution to the question of visceral transposition may soon be forthcoming.

As models of careful description, as well as types of the condition to which this article is dedicated, the writer would particularly advise the perusal of the five under-mentioned and easily accessible papers:—

Matthew Baillie, *Philosophical Transactions*, 1788, vol. lxxviii. part 2; Allen Thomson, *Glasgow Medical Journal*, July 1853; Hickman, *Trans. Path. Soc.*, vol. xx. p. 93 (this writer had the rare opportunity of dissecting two individuals with transposition of viscera within a few weeks); Thurnam, *London Medical Gazette*, 1839, vol. xxvi. p. 181, and M'Whinnie, *ibid.*, p. 31.

J. BLAND SUTTON.

TREMOR.—A form of clonic spasm consisting of rhythmical movements of one or more groups of muscles. It may be coarse or fine according to the muscles affected.

Tremor constitutes an important symptom of many diseases, most of which are treated under their appropriate headings (*see DISSEMINATED SCLEROSIS*).

The tremor constantly met with in alcoholism and delirium tremens is described in the article on **ALCOHOL**; in paralysis agitans (*q.v.*) tremor is almost invariably present, but cases are on record in which the symptom was absent; and in poisoning by lead, mercury and arsenic, tremor is an important symptom, and it is generally also observed in chronic poisoning by chloral and opium. It is often met with in hysterical subjects, where it occurs in association with both paralysis and contracture.

Senile tremor, as its name implies, attacks the aged. The arms and head are the parts chiefly affected. When tremor occurs without association with nervous disease in persons who have not

passed middle life it is generally termed "simple" tremor. A coarse tremor occurring only on movement is often met with in exophthalmic goitre. Tremor is often present in conditions of debility—for example, during convalescence from acute disease—and passes off as strength is regained.

Diagnosis.—In disseminated sclerosis the tremor is irregular, and the movements are sudden and jerky, and are much increased by any voluntary effort of the patient to restrain them; they occur only on movement, and cease during rest. In paralysis agitans the tremor is regular and rhythmical, and occurs during both rest and movement, except in an early stage of the disease, when it may cease during rest.

Senile tremor occurs at first only on movement, and ceases, or almost so, during rest, but when severe it may be present during both rest and movement; it is more influenced by the latter than is the tremor of paralysis agitans, and in this form the head is more often affected than in paralysis agitans. Alcoholic tremor occurs only during movement, and affects chiefly the arm, face and tongue.

Treatment.—This will depend upon the nature of the causal condition. In simple and senile tremor but little is to be expected from treatment; a trial may be given to nervine tonics and sedatives.

TRICHINOSIS.—A disease produced by the ingestion of meat containing a minute helminth, the trichina spiralis. The male worm, when found free, measures $\frac{1}{16}$ th inch in length. The female is larger, measuring nearly $\frac{1}{4}$ th inch in length.

In the muscles the worm is found coiled up in a lemon-shaped capsule, at either end of which is a small collection of fat globules. The long axis of the capsule lies parallel with the muscular fibres. The worm may be found in the fæces.

After the trichinous meat (pork or sausages) has been eaten, the course of events is as follows:—In two days the larvæ become mature, in about six days the embryos are born, and in the course of the next week they proceed to migrate to all parts of the body, establishing themselves finally in the voluntary muscles, where they become enclosed in a thin, but subsequently laminated, lemon-shaped capsule. When this stage has been reached, the trichinæ are absolutely quiescent, and no symptoms may betray

their presence. Ultimately the enclosing sac becomes calcareous. Prior to encapsulation, nausea, vertigo and fever are the earliest symptoms noticeable. These are followed by diarrhoea, prostration, and a stiff and painful condition of the extremities. At the end of a week the fever increases, the face becomes cedematous, and the voluntary muscles throughout the body swollen and painful. There may be aphonia and pain on moving the eyes, whilst perspiration, insomnia and delirium are among the graver symptoms of this period. The helplessness of the patient is extreme. In a month or so improvement may set in, a gradual amelioration of all the symptoms being observed, and desquamation usually takes place. The patient however, may die from exhaustion with high fever before the end of the month, or from pneumonia or other complication.

Treatment.—As regards treatment, not much can be done except to try and relieve the pain and allay the fever by general measures. If seen within a day or so of taking the trichinous food, it might be well to empty the alimentary canal with a calomel purge. The trichinæ are destroyed by cooking, therefore only those who eat uncooked meat can become the victims of this disease.

TRIFACIAL NERVE, DISEASES OF (Fifth Nerve; Trigeminal).—This nerve, arises from the side of the pons Varolii by two roots, motor and sensory. The former, the smaller, comes from a nucleus lying rather deeply below the lateral angle of the fourth ventricle, and above the facial nucleus; the sensory nucleus is larger and lies to the outer side of the motor, and it also receives fibres from the so-called ascending root of the trigeminal.

The fifth is the largest of the cranial nerves and consists of three parts, or divisions as they are termed, the ophthalmic, the superior maxillary, and the inferior maxillary; of these the two former are connected with the Gasserian ganglion, and are purely sensory.

The *Ophthalmic* supplies the integument of the nose, upper eyelid, and forehead, and the upper part of the hairy scalp, the mucous membrane of the nose and eyelids, the ball of the eye, and the lachrymal gland.

The *Superior Maxillary* gives sensation to the skin above the zygoma, the lower eyelid, the side of nose, the upper

teeth, and the mucous membrane of the roof of mouth, nose, and upper part of pharynx.

The *Inferior Maxillary*.—The third division contains all the motor fibres, which do not pass through the Gasserian ganglion, and gives motor fibres to all the muscles of mastication as well as to the mylo-hyoid and digastric muscles, whilst the sensory part passing through the ganglion, supplies the skin of the lower lip and lower part of face, the lower teeth, the mouth, tongue, the side of the head and the ear, and the salivary gland.

The *Gustatory Nerve*, from this division, supplies the function of taste to the anterior two-thirds of the tongue.

The nerve is liable to be affected by local disease within the pons Varolii, as softening, hæmorrhage or tumour; outside the pons by meningitis, growths, or carious bone; and the individual branches are apt to be involved in growths in the orbital or speno-maxillary fissures. In locomotor ataxia, the fifth nerve is liable to be paralysed along with other cranial nerves. Paralysis is the most important affection, and may involve either the whole nerve or one or more of its divisions; other affections are neuralgia of the sensory part and trismus of the muscles supplied by the motor fibres.

Paralysis.—When the whole nerve is paralysed, the symptoms may be described under the head of (1) *Sensory*, (2) *Motor*.

(1) *Sensory.*—There is loss of sensibility to tactile and painful impressions in the parts supplied, the anæsthesia being often preceded by tingling or pain. The anæsthesia will include the corresponding half of the face and adjacent side of the head, as well as the conjunctiva, and mucous membrane of the half of the nose, lips, tongue, hard palate, anterior pillar of fauces, and the soft palate of the same side. As a consequence of this the conjunctiva can be touched, the nostril may be irritated by ammonia, and the fauces of one side can be tickled without any reflex actions being evoked. The patient bites on the other side as he cannot feel the food, and as a result fur collects on the affected side of the tongue. Smell is lost owing to the dryness of the nasal mucous membrane. Taste may be completely lost from disease of the root of the trigeminal (Gowers), but disease of the gustatory nerve, after it has been joined by the chorda tympani, causes loss of taste in the anterior two-thirds of the tongue; no effect is, however, produced when the

lesion in the gustatory is above this junction.

Besides the above symptoms there are certain trophic changes of importance. The secretions, including those of the lachrymal and salivary glands, are diminished; herpes zoster of the face and inflammation of the cornea are considered to be especially due to irritation and disease of the Gasserian ganglion; in the latter case the cornea becomes cloudy, opaque, ulcerates, and the whole eye may become disorganized and destroyed.

(2) *Motor*.—The chief motor symptom is an inability to use the muscles of mastication of the affected side; the patient cannot bite hard, and the temporal and masseter muscles can be felt to contract feebly or not at all. Owing to paralysis of the external pterygoid the lower jaw cannot be carried over to the opposite side in grinding the food, and in opening the mouth the lower jaw drops over towards the paralysed side, being drawn there by the healthy external pterygoid of the other side.

Diagnosis.—This is not difficult when the symptoms are well marked; in the early stages the pain produced by irritation of the nerve may simulate simple neuralgia, but in the former case the pain is more persistent and passes on to anæsthesia and motor paralysis of the parts supplied by the nerve, which is a certain proof of organic disease. Loss of sensation of the face and mucous membranes is met with in hemi-anæsthesia of organic or functional origin, but in these cases the anæsthesia extends beyond the anatomical distribution of the trigeminus, to the head, nerve, limbs, or the whole of one side may be affected, and this is also associated with hemiplegia and affection of all the special senses of the same side. The seat of the disease will be shown by the anatomical relations of the part affected.

Treatment.—When due to cold, hot fomentations should be applied to the side of the face and the head, and if any inflammation be present a blister may be applied behind the ear. If the pain is very severe, local sedatives, as cocaine or menthol, may be required, or morphine hypodermically. In cases where syphilis can be made out or suspected, iodide of potassium in full doses should be given. Faradization of the face with the wire brush has been recommended, to promote the return of sensation.

C. E. BEEVOR.

TRISMUS NEONATORUM.—

A form of tetanus only met with in infants.

Symptoms.—The onset is gradual but the course is rapid. At first the child is peevish and cannot take the breast properly, its mouth is found to be fixed, and subsequently the whole body becomes more or less rigid; general convulsions lasting perhaps half-a-minute, come on in paroxysms, at intervals of one or two minutes. During the attacks the child becomes livid, the hands and feet are clenched, and the spine is arched backwards (opisthotonos). The condition of the mouth is most important and characteristic, at first it is a little open and the angles are drawn down, then the jaws become closed, and the angles more drawn down, so that the child can neither suck nor swallow. In the intervals between the paroxysms the rigidity does not wholly pass off. A mere touch or even the attempt to swallow is sufficient to induce a paroxysm. There is generally some fever and there may be hyperpyrexia.

Prognosis.—Death results from asphyxia, usually within thirty-six hours of the onset, during a convulsion, or from coma. If the child survive the sixth day there is some chance of its recovery.

Morbid Anatomy.—Intense congestion of the vessels of the spinal cord and its membranes, with hæmorrhages external to the theca are almost constant lesions, but it is not proved that they are the cause of the symptoms: they may be the effect. Congestion of the brain and its membranes has been found.

Pathology and Ætiology.—The disease almost invariably ensues in the first five days of life, rarely after the end of the first week, it is a very fatal affection and the earlier it appears the more rapid is its course.

The theory that it is dependent upon some condition of the umbilical cord is far from proved, inflammation of the cord or thrombosis of some of its veins is by no means constant, but it may be noted that in traumatic tetanus there is frequently no inflammation of the wound. It has been attributed to pressure on the medulla and nerves by a faulty position of the occipital bone, but it appears much more probable that it is in some way dependent upon defective hygienic surroundings, for some years ago it was exceedingly common in a Dublin lying-in hospital, and became rare directly the sanitary arrangements of the building were made satisfactory.

Treatment.—Hygienic measures should be adopted as preventive whenever the disease is found to be of frequent occurrence. Placing the child on its side and manipulating the occipital bone into a different position has sometimes, it is said, resulted in the disappearance of the symptoms. During the attack hot or cold baths or ice to the spine should be tried; chloroform might be administered, and bromide of potassium or Calabar bean given internally; but treatment has not hitherto seemed of much avail.

TROPHIC NERVES.—That nutrition can go on independently of a nervous system is clear from what occurs in plants and the lower animals. Nevertheless, the theory is held that in the higher animals it is a function of the nervous system so to co-ordinate the metabolic processes in the different tissues of the body that their nutrition shall be healthy. Injury to certain parts of the nervous system is believed to disturb this co-ordination in such a way that the nutrition of the parts is visibly altered, and such alterations constitute trophic lesions. The nerves which are supposed to preside over nutrition are called trophic nerves.

It is impossible in most cases to prove the existence of trophic nerves with absolute certainty; nevertheless, in many instances their existence is extremely probable. The only certain examples of trophic influence which have been localized are, first, that which the posterior spinal ganglia have over the nutrition of sensory nerve fibres; for, if the nerve root be cut either side of the ganglion, such of the nerve as is still in connection with the ganglion remains healthy, but the part which is severed from the ganglion degenerates. Secondly, some, at least, of the sympathetic ganglia have a similar influence upon the nerve fibres attached to them.

As instances of trophic influence which cannot be precisely localized, the following may be mentioned:—

If the anterior spinal nerve root be cut, the part which remains attached to the spinal cord is unaffected, but the distal part degenerates; the degeneration of its fibres extends down into the mixed nerve, just as when the posterior root is divided on the distal side of its ganglion the degeneration of its fibres extends down into the mixed nerve. When in the rabbit the trigeminus is cut in the skull, the cornea becomes cloudy, and ulcers form inside the nose

and mouth. It is highly probable that this is owing to the fact that this nerve exerts a trophic influence upon these parts. The salivary glands are almost certainly under the control of trophic nerves.

We will now pass to a consideration of those pathological conditions which have been attributed to trophic disturbance.

1. Trophic Lesions of Nerves.—

Whenever a nerve fibre is separated from one of the nerve cells, or the only nerve cell, to which it is attached, it degenerates. Thus, we have seen that the fibres of the posterior root degenerate when separated from the posterior ganglion, and that the fibres of the anterior root degenerate when separated from the cord, because the cells in the anterior cornua exert a trophic influence on them. The fibres of the crossed and direct pyramidal tract degenerate when separated from the cells of the motor area of the cortex. Under certain circumstances other tracts of fibres in the cord degenerate, but it is not known what cells exert a trophic influence upon them. As a rule fibres degenerate in the direction in which they conduct, but exceptions are the degeneration away from the posterior root ganglion of the sensory fibres in a mixed nerve and the degeneration away from the gyrus fornicatus of the fibres connected with it. This process of degeneration is called Wallerian, after A. Waller, who first described it.

The time at which it begins varies in different species, but soon after the destruction of the trophic cells or the separation of the nerve fibres from them the nuclei of the fibres become larger, and the amount of protoplasm around them is increased. This protoplasm so increases that at places it extends right across the nerve fibres, and consequently splits up the myelin, first into large, then into smaller particles, and at the same time or rather later destroys the axis cylinder. The fatty myelin forms drops in the protoplasm; these undergo some change in chemical composition, and ultimately are absorbed. While these changes have been going on, the enlarged nuclei have subdivided. After the absorption of the myelin, the nerve fibre shrinks; the process goes on simultaneously along the whole fibre. Regeneration takes place if the trophic centre is not completely destroyed, by the new growth of axis cylinders from the healthy portion of the nerve; these grow

down among the degenerated fibres; some apparently die, but others become clothed with a sheath of myelin and are in some few months functionally active. The changes undergone by the nerve fibres of the central nervous system are the same as take place in the peripheral nerves.

2. Trophic Lesions of Muscles.—Either irritative or destroying lesions of the ganglion cells of the anterior cornua of the spinal cord and their homologues in the medulla and pons, or of the efferent fibres which unite these cells with the periphery may give rise to active trophic lesions of muscles. Thus, they are met with, for example, in acute anterior polio-myelitis and in peripheral neuritis. Whether the same cells have both a motor and a trophic function is not known, but it is clear that, if not, the motor and trophic cells must be close to each other. At first the only change to be seen in the muscles is that the individual fibres have become narrower; for the most part the striation remains as usual, but sometimes the transverse striation is indistinct; while the longitudinal is very evident. At this stage the process is recoverable, but, if it proceed, the fibres become filled with fine granular matter, in which fat globules ultimately appear, only to be absorbed. Next there is a great multiplication of the muscle nuclei and also of those of the connective tissue between the muscle fibres. These nuclei ultimately develop into fibrous tissue; by this time recovery is quite impossible, and what was the muscle becomes a mass of fibrous tissue with a few remnants of granular muscle fibres. The bulk of the muscle is considerably decreased. The whole process occupies several weeks. These trophic changes in muscle are always accompanied by a reaction of degeneration, which is never met with unless such changes are going on in the muscle. It is most important to remember that these trophic alterations in the muscle can only occur under the conditions stated, and that therefore they are never found in simple atrophy of muscle, as, for example, in the atrophy that comes from disuse, or in primary muscular atrophy, or in pseudo-hypertrophic paralysis. Nor do they ever occur when the lesion is above the motor cells in the cord, medulla, or pons.

Nothing is known of the trophic changes of plain muscle fibres.

3. Trophic Lesions of the Skin.—It is not known which part of the central

nervous system controls the nutrition of the skin. There are so many varieties of cutaneous trophic changes that they must be described separately.

(a) *Vaso-motor Disturbances.*—These occur chiefly in diseases of the peripheral nerves; for example, flushing over the painful spot is common in neuralgia, vaso-motor dilatation is seen when an aneurysm or tumour paralyses the cervical sympathetic (see SYMPATHETIC SYSTEM), and increased redness has been met with in association with disease of other nerves. Vaso-motor alterations are occasionally observed in lesions of the central nervous system, but then they are generally preliminary to some more important trophic lesion, such as an acute bed-sore. Sometimes the vaso-motor disturbance is accompanied by œdema, which may be general over the whole area of distribution of the nerve or may be patchy, giving rise to urticaria; and often in nervous diseases, even when there is no obvious vaso-motor alterations, a mild irritant produces severe and widespread redness, which readily passes on to vesication and even gangrene, hence blisters should be cautiously applied.

(b) *Vesicular and Bullous Eruptions.*—These also are mostly associated with disease of the peripheral nerves. Herpes occurring over the intercostal and other nerves is a familiar instance (see HERPES), and has been proved to be due to a neuritis situated at the exit of the nerves from the spinal canal. In the face, herpes of the fifth nerve is often accompanied by so much œdema that careless observers, failing to notice its unilateral character, have mistaken it for erysipelas. It may be accompanied by a rise of temperature, and is a very painful affection; the pain often persists after the herpes has disappeared. Herpes is met with in peripheral neuritis, and also in tabes dorsalis, when it may be due to the accompanying peripheral neuritis. Occasionally the vesicles become pustular, and then the lesion simulates eczema. The occurrence of bullæ large enough to remind one of pemphigus, which is not a nervous disease, is rare, except where they are the precursors of acute bed-sores. It is doubtful whether lesions of the central nervous system ever lead to herpes, for in most of the recorded cases the post-mortem examination has been incomplete.

(c) *Glossy Skin.*—This condition is seen in neuritis or traumatic lesions of peripheral nerves. The fingers are most

frequently affected, sometimes also the palm, rarely the dorsum of the hand. In the foot the toes suffer, occasionally the dorsum, very rarely the sole. In a well-marked case the fingers are usually tapering, smooth, hairless, devoid of wrinkles, glossy, pink or ruddy or blotched as with permanent chilblains. They are commonly also very painful, especially on motion; the pain often extends up the arm. The condition is, in some respects, not unlike scleroderma; in fact, one variety of scleroderma—viz., morphœa—is an atrophy of the skin distributed along the course of a nerve, usually the supra-orbital branch of the fifth.

(d) *Scaly Conditions of the Skin.*—In rare cases after injury to a nerve or neuritis, the skin supplied by it becomes scaly and dry.

(e) *Pigmentary Changes in the Skin.*—A few instances are on record in which, after emotional disturbance, or after injuries to nerve-trunks, patches of abnormal pigmentation have appeared upon the skin.

4. **Trophic Lesions extending deeper than the Skin.**—(a) *Bed-sores.*—The acute variety is especially met with in acute diseases of the spinal cord, such as traumatic lesions and acute myelitis, but not in diseases affecting the anterior cornua only, such as infantile paralysis. Lesions of the cauda equina, and severe cerebral hæmorrhage or extensive softening will occasionally cause acute bed-sores. In the case of cerebral lesions the bed-sore is on the opposite side to the lesion. These bed-sores may form in any part, but the favourite positions are, in order of frequency, the sacrum and coccyx, the trochanters, the ischial tuberosities, the heels, the knees, the vertebral spines, the scapulæ, and the elbows. The first sign of the bed-sore is an erythematous patch, on which in a few hours vesicles develop. These soon burst, and a sore results, which quickly spreads deeply and widely, the sides and base of the ulcer become gangrenous, and ultimately the muscles are destroyed, and the bone is exposed. The whole process is very rapid; it may stop at any point, and recovery may take place. When the sore is over the spinal column, the necrosis of the bone leads to the exposure of the spinal canal; pus thus gets into this, and purulent meningitis is set up. Occasionally also, bed-sores lead to death from pyæmia.

Sometimes, when the nervous disease

leading to the bed-sore is chronic, such as chronic myelitis, the sore is much longer in developing, a large slough forms on the skin, and ulceration around this leads to its being cast off.

Both acute and chronic bed-sores usually form on parts subjected to pressure, but mere pressure will not explain their production, for they may occur in cases in which by careful nursing the pressure has been rendered almost inappreciable, and they occur much more readily in nervous diseases than in any other maladies. It is not known precisely what part of the nervous system must be damaged to produce such bed-sores.

(b) *Perforating Ulcer.*—In this disease the nerves going to the ulcerated part have always been found to be inflamed. The patients nearly always suffer from tabes dorsalis, of which perforating ulcer is an early sign. It is generally accompanied by lightning pains, and has a large area of anæsthesia round it. Its most usual site is the sole of the foot, especially over the metatarso-phalangeal joints of the great and little toes. Rarely it is seen in the hand. First a corn appears, and in the centre of this an ulcer forms and extends deeply, ultimately reaching the bone, which at that spot soon dies. The ulcer looks more like a sinus than an ulcer. There is no discharge. The skin around it is thickened and heaped up. They may occur on both feet, in which case they are usually symmetrical, and there may be more than one. They are often accompanied by trophic lesions of the joints and bones.

(c) *Leprosy.*—The changes in the skin and deeper structures met with in this disease are due to a neuritis. They are described in the article on LEPROSY.

5. **Trophic Lesions of the Nails and Hair.**—In rare cases of tabes dorsalis the nails are particularly prone to fall off, but they grow again, and then fall off again, and this process may be repeated several times in the course of a year or two.

In certain cases of neuritis and myelitis the nails become dry, brittle, and hard.

Under severe emotional disturbance the hair may turn grey, and alterations in colour have been observed in association with neuralgia. In neuritis the hair has been stated to become very dry and brittle in exceptional cases.

6. **Trophic Alterations in the Secretion of Sweat.**—Emotion may greatly increase the secretion of sweat. A uni-

lateral secretion of sweat on the affected side of the body, is met with both in hemicrania and rarely in hemiplegia. Tumours, &c., pressing on the cervical sympathetic nerve sometimes cause an increase, sometimes a diminution, of sweat on the same side of the face (*see* SYMPATHETIC NERVE, DISEASES OF).

7. Trophic Affections of Teeth.—It appears probable that the teeth are more likely to fall out in patients affected with *tabes dorsalis* than in other persons, but the cause of this is not known.

8. Trophic Affections of Joints.—In quite exceptional cases, after injuries to nerves, after diseases of the spinal cord, and after cerebral lesions, the larger joints (on the opposite side of the body in the case of cerebral lesions) have been observed to become red and swollen, so that they look like joints affected with acute rheumatism.

The condition of joint which is known as Charcot's joint disease, and is thought by some to be a trophic lesion, is described in the article on locomotor ataxy, with which disease it is always associated.

9. Trophic Lesions of Bones.—The bones of patients affected with *tabes dorsalis* are very liable to fracture spontaneously. Sometimes nearly every bone in the body may be broken. The fractures heal with the formation of much callus. The femur is the bone most often broken, and those of the leg are more often affected than those of the arm. The inorganic constituents of the bones of patients with *tabes dorsalis* are occasionally only 24 per cent. instead of 66 per cent. as in health.

In anterior polio-myelitis the growth of the bones is retarded.

The bones of insane persons, especially general paralytics, are often so soft that they yield readily to pressure, and thus produce various deformities. At other times they are so brittle that they may crumble under the fingers, and of course are then very liable to fracture.

10. Trophic Affections of the Salivary Glands.—In neuralgia of the fifth nerve the secretion of saliva is often reflexly increased. It may be affected in lesions of the cervical sympathetic (*see* SYMPATHETIC NERVE, DISEASES OF).

In facial paralysis there may be a diminution of the secretion of saliva on the paralysed side.

11. Trophic Affections of the Lachrymal Glands.—The lachrymal secretion may be reflexly increased in trigeminal neuralgia (*q.v.*). W HALE WHITE.

TUBERCULOSIS (including *Scrofula*).—Tuberculosis is a pathological process due to the presence and growth in the tissues of a pathogenic bacillus and characterized in its most typical manifestations by the production of minute rounded or lenticular bodies, which tend to increase in size and then to become caseous in the centre.

History.—Tuberculosis was at first chiefly studied in the lungs, and more than seventy years ago Laennec perceived that the "existence of tubercles in the lungs is the cause and constitutes the true anatomical character of consumption." The next real advance in the conception of the pathological process was the hypothesis propounded by Buhl in 1857, that miliary tuberculosis was due to the absorption into the blood of caseous matter from non-encapsuled yellow tubercle. Though incorrect as a whole the hypothesis shows that the conception of tuberculosis as an infective process had gained ground. In 1865 Villemin showed that tuberculosis could easily be induced in certain animals, especially in rabbits and guinea-pigs, by the inoculation of tuberculous matter from the human subject. Other pathologists confirmed this statement, but were led to believe that tuberculosis could also be induced by inoculation with non-tuberculous material or by the maintenance of chronic local irritations (as by foreign bodies or setons). Further observation has shown that these conclusions were incorrect, the occurrence of tuberculosis under the circumstances mentioned being due to the readiness with which animals of the species experimented on contract tuberculosis if kept in company with other animals suffering from that disease. It fitted, however, with a theory subsequently very widely held that tuberculosis was a non-specific inflammatory process, the peculiar characters of its local and general distribution being due to the fact that the essential element in the process was an irritative overgrowth of lymphoid tissue in the affected organs. The nucleated cells of the so-called lymphoid type were believed to be due to proliferation; the multinuclear cells—the so-called giant cells—which were said to be present in larger or smaller numbers in all tubercles, were believed to be produced by coalescence of a number of such cells, or by protoplasmic budding from the walls of blood-vessels, such buds being the elementary stage of new blood-vessels which never reached full development.

The central caseation of tubercles was attributed to the fact that blood-vessels were not formed. On the other hand it was shown that, in the lungs especially, the cells in acute miliary tubercles might be of the epithelioid type, and one writer even went so far as to assert that acute miliary tuberculosis of the lungs ought to be renamed acute disseminated catarrhal pneumonia. To Cohnheim belongs the credit of recalling attention to the all-important fact that tuberculosis was a specific inoculable malady; he first satisfied himself that the earlier experiments, made by himself and others, which were supposed to have proved that tuberculosis could be produced by the inoculation of other than tuberculous material were not to be relied upon; in the second place he showed that in rabbits and guinea-pigs tuberculosis had a tolerably definite period of incubation. Working with Salomonsen he found that if a perfectly fresh piece of tubercle were introduced into the anterior chamber of the rabbit's eye a slight reaction only occurred, and after a few days the fragment could be seen through the transparent cornea; the fragment gradually diminished in size, and might entirely disappear, but about fourteen days or three weeks after the inoculation a crop of small grey granulations appeared on the iris, these granulations increased in size, caseated, and finally a general tuberculosis ensued. Further, a consideration of all the histological facts had led so good a pathologist as Ziegler to the opinion that a tubercle probably owed its rounded form and definite size to the fact that it was produced by the circumscribed action of an irritant of but slight intensity upon the spot which afterwards became the centre of the tubercle. In 1882 Koch announced the discovery of the tubercle bacillus, and thus supplied the last link in the chain of evidence that tuberculosis is a specific infective disease.

The Tubercle Bacillus.—The bacillus of tubercle is a small, fine, short rod, varying in length from a quarter to half the diameter of a blood corpuscle, its breadth is about one-fifth of its length; each bacillus is, as a rule, slightly bent or curved (*see* EXPECTORATION, Fig. 3). It forms spores which produce slight swellings, so that a bacillus containing several such spores has a beaded appearance. The bacillus behaves in a special manner to certain aniline dyes; the Weigert-Ehrlich staining process is that recommended by Koch. For a descrip-

tion of the method of examining the sputa for the bacillus the reader is referred to the article EXPECTORATION.

Koch first of all cultivated the bacillus outside the body on the surface of blood-serum, solidified by repeated heating to 65° C. He started cultivations from the following human morbid products:—(1) Miliary tuberculosis; (2) pulmonary phthisis: *a.* open cavities, *b.* closed cavity, *c.* caseous pneumonia; (3) scrofulous glands; (4) tubercular testicle; (5) fungous arthritis; (6) lupus. He also started them from the tuberculosis of cattle, and from tuberculosis induced in guinea-pigs by inoculation with human tuberculous material.

The surface of the blood serum was inoculated by spreading out on it a small particle of the tubercular material; the tube was then kept at a uniform temperature of 37° C. (98.6° F.): after an interval of ten to fifteen days the growing colonies appeared as white spots, resembling tiny dry scales adhering to the surface of the serum. When many such colonies form they coalesce into a thin, greyish-white, lustre-less covering. From this material fresh cultivations can be started and continued in series, and the bacilli are found to retain their power of producing tuberculosis in rodents inoculated with these sub-cultures. The bacilli will also grow on meat infusion solidified by Agar-Agar, and in shallow layers of meat infusion, but not on vegetable material. Further, the bacillus does not grow at temperatures below 28° to 29° C. (82.4° to 84.2° F.) or above 42° C. (107.6° F.). Koch points out that the lower limits of temperature at which the bacillus is just able to grow are not reached by summer heat, and that its growth is so slow that before the life cycle could be completed its colonies would be choked by other kinds of bacteria which are present everywhere and develop much more rapidly. Tubercle bacilli must therefore be regarded "not as occasional, but as true parasites—*i.e.*, as finding the conditions necessary to their existence only in the animal or human organisms."

Distribution of the Bacillus in Lesions.—The number of bacilli found in tuberculous lesions varies considerably. They occur in largest numbers at points where the tuberculous process is just beginning or where it is spreading rapidly; they are found within or in the immediate neighbourhood of the accumulated cells which are taking on the epithelioid diameter. As the process advances the bacilli increase in number

forming dense masses; meanwhile the cell nuclei begin to disintegrate, and the cells and nuclei are finally resolved into a granular material. This dead matter forms the central caseous mass, and in it but few bacilli remain, though it probably contains spores, derived from the pre-existing bacilli, by whose agency the destruction of the cells has been brought about. The relation of the bacilli to the giant cells is intimate; in chronic tuberculous processes, such as scrofula and fungous arthritis, but few bacilli are to be discovered, and these are always or almost always in the giant cells, perhaps one or two in each, when, however, the process is more acute the number of bacilli in each giant cell is much more numerous. The bacilli, if numerous, may be grouped at one end of the cell, if still more numerous they are disposed radially, reach to the periphery, and finally cause the destruction of the cell. If a large number of bacilli are introduced directly into the blood stream, and the animal killed shortly afterwards, numbers of white corpuscles in the blood are seen to contain one or more tubercle bacilli, and here and there in the lungs, liver, and spleen a few round cells may be found each containing a tubercle bacillus. It is probable that disseminated tubercle thus originates, and it has been shown that minute tubercles of the arterioles may in the human being rupture into the cavity of the vessel. From a single infective centre also tubercle may be carried along the lymphatics and eventually lead to caseation of the nearest glands.

Pulmonary Tuberculosis.—In the lungs the tuberculous process presents certain peculiarities in its development and mode of spreading owing mainly to the fact that, sooner or later, the caseous area opens into a bronchus, discharges its softened contents and thus becomes a cavity. The bacilli may continue to grow in the walls of this cavity, sometimes universally and with great rapidity, causing rapid softening, at other times at a few points only, while in specially favourable cases the bacilli may entirely disappear, and the cavity may be obliterated by a process of cicatrization. The tuberculous process may spread in the lungs through vascular or lymphatic channels, but the most frequent mode is through the air passages; the infective contents of a cavity are inhaled into other bronchi, and in terminal bronchi and air cells set up the tuberculous pro-

cess coincidently over extensive tracts. Frequently areas of consolidation of lobular form may be found, and are doubtless thus produced. In this way large portions of lung may be almost simultaneously affected producing the condition to which the term caseous pneumonia has been applied. The walls of cavities resulting from the breaking down of such areas are everywhere pervaded by a dense growth of bacilli; this leads to destruction of tissue with so much rapidity that the walls of such cavities are soft, being formed of lung-tissue in which there has been no time for indurating cicatricial processes to occur.

SCROFULA AND LUPUS.—The relation in which scrofula and lupus stand to the more acute forms of tuberculosis is most interesting. On the one hand there can be no doubt that scrofulous glands and joints and lupus-tissue contain tubercle-bacilli, and are capable of inducing typical tuberculosis in rodents, and on the other hand it is obvious that, clinically, acute tuberculosis and lupus are as far as the poles asunder. It is not at present possible to speak definitely on this point. It seems clear, however, that the virulence of the bacillus tuberculosis varies, just as the virulence of the bacillus anthracis varies. Lingard has recently published a series of remarkable experiments showing that whereas in guinea-pigs inoculated with tubercle enlargement of the lymphatic glands in the neighbourhood of the point of inoculation appears in six or seven days, and the animals succumb to the disease in about eighty days, the same animals when inoculated with scrofulous material show enlargement of the glands in two or three weeks, and survive for six or seven months, and when inoculated with lupus show enlargement of glands in four or five weeks, and do not die for eleven or twelve months. The experiments with scrofulous material further proved that as the infection was transmitted from one guinea-pig to another it grew in virulence, thus A, an animal inoculated with scrofulous material, died of tuberculosis in 206 days, B inoculated from A in 131 days, C inoculated from B in 79 days, and D inoculated from C in 60 days (averages). The resistance of the tissues to infection by the bacillus doubtless also varies in different individuals, and in the same individual at different times; it in fact appears probable that the above-noted attenuation of virulence is brought about in and by

the tissues, possibly of the affected individual.

Ætiology.—Tuberculosis is an almost ubiquitous disease, and appears to be quite independent of climate; it is especially a disease of towns and crowded localities, and is favoured by want of ventilation and unwholesome trades. A single phthisical patient ejects daily enormous numbers of bacilli (according to Bollinger, as many as twenty millions). Phthisical sputum resists desiccation and retains its infective properties for long periods, owing, doubtless, to the presence of spore-bearing bacilli in it. The healthy body is, it would seem, capable of destroying the numerous bacilli which find their way into the lungs and intestines from time to time, and it is probable that even in persons with a hereditary or acquired predisposition, infection is not established until a considerable dose of tuberculous virus is accidentally inhaled or ingested. The deteriorating influence of town life, and the fact that the air of rooms and places of public assembly in towns must often swarm with tubercle bacilli, appear to offer an explanation of the increased frequency of phthisis and other forms of tubercular disease in town as compared with country populations. The injurious influence of dusty trades is to be attributed to the catarrhal process set up by the irritating particles. Tuberculosis can also be transmitted to guinea-pigs, pigs, and calves by the milk of cows suffering from tuberculous mastitis, if not also by that of cows with tubercle in other organs, but not in the mamma. This is a probable source of infection in infants and others who drink unboiled milk in large quantities. It is possible also that the flesh of oxen in an advanced stage of tuberculosis may communicate the disease to persons consuming it, for the central parts of roast joints and grilled portions of meat are probably never brought to a temperature sufficiently high to destroy the bacillus, if it be present, as there is some evidence to show.

With regard to phthisis pulmonalis, hereditary predisposition, habits of life, and occupation are probably the most important ætiological factors, but with regard to acute tuberculosis their importance is by no means so clearly established; on the contrary, in the present state of knowledge, clinical and experimental, the more probable opinion is that the most important factor is the introduction into the economy of an adequate dose of the bacillus tuberculosis in a

virulent state, and that, in fact, acute tuberculosis is ætiologically as distinctly an infectious disorder as typhoid fever, (*see also* PHTHISIS).

DAWSON WILLIAMS.

TUBERCULOSIS, ACUTE.—Tubercle bacilli occasionally gain entrance into an artery, vein or lymphatic vessel, and are then rapidly disseminated throughout the body, miliary tubercles appearing in various organs almost simultaneously. The pia mater and the lungs may be thus attacked at or about the same time, or the serous membranes may be affected quickly, one after the other, in either case constituting the condition known as acute tuberculousis.

Speaking generally, it may be stated that when tubercle is widely disseminated, if the cerebral meninges be affected, the symptoms of that lesion will probably overshadow those due to the condition of the lungs and abdomen, and in a very large proportion of cases of acute tuberculosis, especially in children, the meninges are affected. The focus from which the bacilli are disseminated is, in the majority of cases, a pulmonary lesion, but any tubercular nodule may be the starting-point of a general infection.

It is unnecessary here to again describe the symptoms, either of tubercular meningitis, peritonitis or pleurisy; they will be found on reference to the appropriate headings (MENINGES, CEREBRAL, INFLAMMATION OF; PERITONITIS, TUBERCULAR; and PLEURISY, TUBERCULAR), but no description is elsewhere given of acute tuberculousis of the lungs.

Acute Tuberculosis of the Lungs.—A rapid infiltration of tubercle throughout the lungs is a common event in the course of phthisis (*i.e.*, pulmonary tuberculosis), and is one of the most frequent modes of termination of that disease, of which it is really only one of the most acute varieties.

The *symptoms* closely resemble those of a specific fever, and the disease at its outset is not unfrequently mistaken for typhoid fever. The early history of the case will depend upon the site of the primary tubercular lesion, but even when this is situated in the lungs there may have been no symptoms prior to the onset of the attack suggesting such a condition, or they may have been forgotten or overlooked. The patient becomes gradually ill, suffers much from dyspnoea, which tends to increase as the disease goes on. The pulse is rapid and the temperature generally high, although subject to much

variation. It may be as high as 104° or may remain below 102° . There are daily fluctuations of an irregular type, the highest point being sometimes in the forenoon. In cases due to the breaking down of an old apical lesion, the attack may be ushered in by hæmoptysis. The amount of cough and expectoration will depend upon the degree of catarrh present; as a rule, the sputa are scanty.

There is almost always an excessive degree of sweating, but in rare cases the skin is dry. The countenance is generally dusky and sometimes cyanosed, and the expression of the features is always one of anxiety. There is marked emaciation, and, as the disease progresses, symptoms of cerebral disturbance probably begin to show themselves, and eventually the patient sinks into the "typhoid state," with sordes, a dry brown tongue, delirium and stupor gradually deepening into coma.

The *physical signs* which attend these very marked symptoms are often most equivocal. The expansion of the chest may be found to be a little defective at one apex, if an old lesion be present there, but the resonance on percussion is unimpaired by the recent lesions. The breath sounds are generally harsh, and are often accompanied by fine crackling râles. If bronchial catarrh be present, rhonchus and sibilus will be audible, and the expiratory sound will be prolonged. The vocal resonance is usually unaltered.

The *diagnosis* has often to rest upon the symptoms alone. The high temperature, rapid respiration, with no obvious physical signs to account for it, and the increasing cyanosis and sweating form the main points upon which it may be established. From typhoid fever the distinction is often very difficult, especially as enlargement of the spleen occurs in both diseases. From the examination of the sputa for bacilli, and of the eye for evidence of tubercle in the choroid, positive indications may often be obtained when all other signs are of doubtful significance (*see p. 875*).

Prognosis.—The disease rarely extends beyond three weeks, and may be even more rapidly fatal.

Pathological Appearances.—The lungs are infiltrated, sometimes throughout, with milary granulations in an almost uniform stage of development. These are of a pearly white or greyish tint and of firm consistence, but may be softer and of a yellowish colour, tending towards rapid caseation. When acute tuberculous has supervened upon pre-existent

tubercular lesions in either lung, the appearances proper to such changes will, of course, be present in addition. In the rapidly fatal cases the granulations are unaccompanied by any obvious inflammatory change. The tubercles are formed for the most part in the spaces around the minute arterioles.

The tubercles are generally more numerous in the upper lobes, particularly if old phthisical lesions be present there. When not situated in the lung a careful search is often necessary to discover the source of primary infection. The bronchial glands should be closely examined; attention must be paid to any bone disease present; whilst in males the prostate gland and the vesiculæ seminales, and in females the Fallopian tubes, are in rare cases the starting-point of a general tubercular infection, in which the lungs share.

Ætiology.—Acute tuberculosis of the lungs may occur at any age; it is decidedly more common in males than in females. In children the disease is commonly associated with tubercular meningitis, the lungs being often free from old lesions, whilst in adults there is often evidence of an arrested pulmonary tubercular lesion which has recently broken down.

Treatment can only be directed towards the maintenance of the patient's strength by appropriate food and stimulation, and to the relief of troublesome symptoms as they arise.

TYMPANITES (Meteorism).—

Distension of the abdomen from inflation of the intestines with gas. In very exceptional cases, and then usually after perforation of the stomach or intestine, the gas may be in the peritoneal cavity. It is due partly to an increased formation of gas and partly to a sub-paralytic condition of the intestinal walls. In peritonitis, enteric fever, and acute intestinal obstruction, it is sometimes very marked, and may be the source not only of some discomfort but of actual danger to life from the impediment to respiration owing to the pushing up of the diaphragm. The abdomen is everywhere resonant. In less degree flatulence accompanies all forms of chronic, gastric and intestinal disturbance.

Treatment.—Internally, antispasmodics (such as spirits of ammonia in 30-minim doses) may be tried, or brandy may be given; enemata of turpentine have sometimes been found of service. The pas-

sage of a long tube into the large bowel as high as possible may give relief, or, as a last resort, the large bowel may be punctured in two or three places with a fine trocar, but this latter measure is by no means free from danger.

TYPHOID FEVER (Enteric Fever).—A febrile disease, produced by a specific poison and characterized by inflammation and sloughing or ulceration of the glands of the small and sometimes of the large intestine, and especially of the agminate and solitary glands of the ileum, together with infiltration of the mesenteric glands, and enlargement of the spleen, and the presence of an inconstant roseolous rash.

SYMPTOMS.—After infection a period of latency or incubation elapses before the commencement of the symptoms. In cases where this has admitted of being accurately fixed, it has generally been between 10 and 14 days, but it may vary from 5 days to upwards of three weeks.

Commonly this period is free from symptoms, but sometimes there is more or less malaise, and occasionally, at the commencement, diarrhoea and vomiting, which subside again after a few days.

The onset of the disease is often somewhat insidious, the patient feels languid and indisposed to exertion, has aching pains and a sensation of weight in his limbs, suffers from headache, passes restless nights, his sleep is disturbed by dreams and appetite is lost. Occasionally in this early stage there are signs of intestinal irritation, as abdominal pain and diarrhoea, and, especially in children, vomiting. These cases are often at first regarded as ordinary diarrhoea. The tongue becomes furred and red at the tips and edges, the pulse accelerated, and the temperature rises, often by somewhat regular gradations, so that every night it is 1 or 2 degrees higher than on the previous night, the morning temperature being 1 or 2 degrees below the evening.

Usually these premonitory symptoms last for from 5 to 6 days before the patient is compelled by increasing weakness to take to bed.

Not unfrequently, however, typhoid fever begins like other acute diseases with distinct chills or even rigors, headache, pain in the back and limbs, and the patient takes to his bed after 2 or 3 days.

Sometimes the early stage of typhoid is accompanied by anomalous symptoms which may greatly increase the difficulty

of diagnosis. Neuralgic pains and hyperæsthesia of the muscles, much increased on movement, simulating rheumatism, may occur; these may be associated with cutaneous hyperæsthesia. Sometimes there is hemicrania, or supra-orbital or occipital neuralgia or even earache. In other cases the patient complains of dryness and soreness of the throat, and as there is occasionally a slight diffused febrile blush on the skin and the tongue is red, the case may be mistaken for scarlatina.

By the end of the first week the symptoms of the disease are usually well pronounced, the patient, who complains of headache, thirst and general malaise, has a wearied, languid aspect, but does not present the stupid, heavy look which characterizes typhus. There is often a pink flush on the cheeks, the eyes are not suffused, the pupils are often large, the tongue is red at the tip and edges, and coated with a white or yellowish fur, sometimes the centre of each half presents a furred strip, the intervening portions being red. The lips are parched and desquamating, the pulse may vary from 100 to 120, and though often full, is soft, with a tendency to diastolic, the abdomen is commonly tumid, often there is gurgling on palpation in the right iliac fossa with some pain and tenderness. The bowels are usually loose, the motions liquid, of a yellow ochre colour, resembling pea soup, and of an alkaline reaction. Not unfrequently, however, there is constipation. The spleen is enlarged, sometimes the lower end can be felt at the costal arch. Usually the enlargement can only be detected by percussion in the lower axillary region, but when the stomach is much inflated this sign, which is of great diagnostic importance, may be obscured.

Epistaxis not unfrequently occurs, and is sometimes so profuse as to endanger life; it may take place at any period of the fever.

The skin commonly feels hot and dry, but this condition often alternates with perspiration. The temperature may vary from 102° to 105° F. in the evening, and is generally one or two degrees lower in the morning. The characteristic eruption, when present, usually makes its appearance between the seventh and twelfth days. It consists of slightly elevated papules of a rose pink colour, measuring about two lines in diameter, uniform in size, and disappearing on pressure. They come out in successive crops, each spot lasting from 3 to 5 days and then fading,

and they continue to come out during the whole course of the fever. In rare cases the spots have been observed to be acuminated, with a small vesicle on the summit. Sometimes, when the rash is very abundant, the spots are much darker in colour and persist on pressure. The spots have been observed as early as the fifth day, and their appearance may be delayed till the fourteenth, or even later. They generally cease to appear after the middle or end of the third week, but in cases in which intercurrent relapses take place they may continue to come out for five or six weeks. The number of the spots is often very small, so that they may be easily overlooked; they are generally confined to the abdomen, chest, and back. Sometimes the eruption is very copious, and may then extend to the extremities, and even to the face. It is often considered that there is no relation between the amount of the eruption and the severity of the attack, but, in the experience of the writer, when the eruption is very profuse and dark the case is usually a severe one. The eruption is by no means always present, and is more frequently absent in children under 10 and in adults over 30 than between those ages. As in most specific fevers hæmorrhagic spots occasionally occur, but they are independent of the rose spots. In rare cases pale blue spots have been observed, the *tâches bleuâtres* of Trousseau. They appear to have no significance. *Sudamina* are not very uncommon, and usually the so-called *tâche cérébrale*, a red line with a white border on each side, can be elicited by drawing the back of the nail across the skin; this is an indication of increased irritability of the vaso-motor nerves, and is especially frequent when the pulse is dicrotic. It should most probably be regarded as a phenomenon of fever generally, rather than of the specific typhoid process.

The urine presents the usual characteristics of fever; it is concentrated, high-coloured, strongly acid, contains an excess of urea and uric acid, sulphates and potash salts, with deficiency of chloride of sodium. In the later stages of the disease it is often albuminous.

Ehrlich's Test.—The urine of cases of typhoid fever may give a peculiar reaction with sulpho-diazobenzol. This is produced by adding to an equal volume of urine a mixture consisting of 25 parts of a 20 per cent. solution of hydrochloric acid saturated with sulphanilic acid, and one part of a half per cent. solution of

sodium nitrite, an excess of strong liquor ammoniac is then added. A deep orange-red or purple colour is produced, the colorization of the froth on shaking the mixture is especially characteristic. This reaction cannot, however, be always obtained, and may be present in many other diseases, especially measles. The acid solution and the sodium nitrite solution should be mixed together immediately before using.

During the second week the patient usually ceases to complain of the headache and other pains, but there is increasing weariness, progressive emaciation, and in severe cases delirium may begin to appear, at first during the night, or on waking out of sleep. Sometimes the patient is sleepless and restless at night, sometimes drowsy and apathetic; deafness is a common symptom, it is often regarded as not unfavourable, but it usually indicates a severe case.

During the third week the diarrhœa usually becomes more severe, the motions are often very offensive and may contain shreddy sloughs. Signs of pulmonary complications may appear, there is not usually cough, but the breathing is accelerated, the face somewhat dusky, and moist râles are audible over the backs of the lungs. In severe cases what is known as the **typhoid state** may become developed, the patient lies on his back and sinks down in the bed, there is muttering delirium and stupor, subultus tendinum, the tongue is dry and brown or glazed and red and transversely fissured, there are sordes on the lips and teeth, the impulse of the heart is feeble, the first sound faint and short, the pulse markedly dicrotic, the belly distended and tympanitic, the bladder often paralysed, the urine albuminous, the motions are passed involuntarily, bed-sores form over the sacrum, and the patient may die in a state of coma.

It is only in very severe cases that this condition is developed to such a degree: but during the third week the patient is liable to severe hæmorrhage from the bowels and perforation.

Commonly towards the end of the third or the beginning of the fourth week the fever begins to abate, the morning temperature falling more rapidly than the evening, so that the type of the fever becomes more and more remittent, and after a few days defervescence is complete. For some time the temperature is subnormal, but is liable to be temporarily sent up by very slight causes. The presence of compli-

cations or the occurrence of recrudescences may much prolong the course of the fever, which may thus extend over periods of five or six weeks, or longer. Convalescence, too, is liable to be much retarded by the presence of complications, especially the slow healing of the intestinal ulcers; it is also liable to be interrupted by relapses.

Though this may be regarded as the typical course of a case of well-marked typhoid, few diseases are subject to such great variations. The forms of typhoid may be divided into those where the symptoms caused by the general infection of the system predominate, and those in which they are in the main due to the intestinal lesions.

The severity of the constitutional affection and the extent of the intestinal lesions, though commonly, are not always, in agreement.

Varieties of the Disease.—Among the more common forms of typhoid are:

1. *The Acute Form.*—This is characterized by severe febrile disturbance of rapid onset, often preceded by rigors, high temperature, great nervous oppression, early delirium, and by a tendency to pulmonary congestion; death may take place in the second or even in the first week, though usually the disease runs on the usual time; there may or may not be severe intestinal lesions.

2. *The Abortive Form.*—Here the early symptoms are often well marked, but sometimes between the eighth and fourteenth day defervescence takes place often by a pretty sudden crisis. It is probable that in these cases resolution and absorption has taken place in the inflamed intestinal glands without the occurrence of sloughing or ulceration.

3. *The Latent Form.*—The febrile disturbance is very slight, but the intestinal lesions have the usual characters. Commonly these patients have diarrhoea, and some degree of general malaise, and their temperature is above normal, but they continue to follow their ordinary avocations and walk about as usual, hence this is often termed the "ambulant" form. The neglect of proper precautions renders these cases very liable to perforation and hæmorrhage.

4. *The Afebrile Form.*—This form is of rare occurrence. Although the general symptoms, and especially the nervous symptoms, as delirium and stupor, may be well marked, and the rash abundant, the temperature throughout is normal or even subnormal. The intestinal lesions are usually slight, and

the disease often terminates at the end of a fortnight. An epidemic of this type occurred in the German army besieging Paris, and was attributed to the great hardships which the soldiers had undergone. Isolated cases occur occasionally, in these the severe symptoms noticed in the above-mentioned epidemic are seldom observed.

Mild forms of typhoid are often termed gastric fever, bilious fever, infantile remittent fever, &c. In malarial districts the disease is modified by the influence of the malarial infection, and the term typho-malarial fever has been applied to the fever under these circumstances.

Complications and Sequelæ.—Under this head will be included not only those affections which only occasionally occur, but also the ordinary effects of the disease when they are more marked than usual.

Of the complications due to the intestinal lesions hæmorrhage and perforation are the most important. They may occur at two periods, which may be termed the early and late; the early during the detachment of the sloughs, most commonly in the latter half of the third and the first half of the fourth week, though they have been met with as early as the beginning of the second week; the late may occur at any time from the separation of the sloughs to the complete healing of the ulcers, and are due to the ulcers not granulating but becoming atonic. These accidents may therefore occur when the patient appears to be convalescent.

The Symptoms of Perforation are usually the occurrence of a sudden pain, followed by general peritonitis, diffused abdominal pain, great tenderness, and tympanites, together with symptoms of collapse. The pulse becomes very frequent and small, the breathing is thoracic, the countenance pinched, the temperature may either rise or fall, according as the symptoms of inflammation or collapse predominate. Not infrequently, especially if the patient be in the typhoid state, these severe symptoms are absent, and the chief indications are abdominal distension and increase in the prostration. The abdominal distension is generally due to the intestines being paralysed by the peritonitis, but sometimes a considerable quantity of gas escapes into the peritoneal cavity. This can often be recognized by the liver dulness being completely obliterated, owing to the gas accumulating in the upper part

of the abdominal cavity between the liver and the diaphragm and abdominal wall, whereas in flatulent distension of the bowels the liver is usually merely displaced upwards, unless indeed the colon, as sometimes happens, rolls over it. Perforation of bowel almost always proves fatal within two days, but where the extravasation and peritonitis have been limited by adhesions, recovery with or without the formation of a faecal abscess has been known to occur. Acute general peritonitis occurring during typhoid fever is by no means necessarily fatal, but probably where recovery has taken place there has not been actual perforation. Peritonitis may also be set up by the rupture of an inflamed and softened mesenteric gland.

Hæmorrhage.—Intestinal hæmorrhage, like perforation, most commonly occurs during the latter half of the third and the first half of the fourth week, and often recurs several times. The amount may vary from a slight oozing to several pints of arterial blood. The blood passed may be either dark or bright red, and is often more or less clotted. When the hæmorrhage is at all profuse it causes a sudden fall of temperature, pallor and collapse. A moderate hæmorrhage does not in itself necessarily give rise to any serious symptoms, but it is an indication of deep ulceration, and we often see hæmorrhage and perforation in the same case. Severe hæmorrhage sometimes proves fatal. Hæmorrhage, like perforation, though more frequent where there has been much diarrhœa, may also occur where the bowels have been constipated.

Tympanites is another frequent symptom in typhoid; a moderate degree is usually present; but when the amount is very great it is a most unfavourable symptom. It usually indicates severe intestinal ulceration, and also, especially when it occurs early, a failure of nerve power. It may greatly distress the breathing, and it favours perforation by stretching the ulcerated bowel. Murchison considered that the gas is chiefly contained in the colon, but there can be little doubt but that the small intestines are also distended. It is greatly increased by the occurrence of peritonitis, and often a distended motionless belly is the chief indication of perforation.

Ulceration of the large intestine, affecting the solitary glands, occasionally occurs, and the lesions may even be more extensive here than in the ileum. Hæmorrhage and perforation are liable

to occur. This condition may often be recognized by the frequency and persistence of the diarrhœa, the extremely offensive motions, and often by the presence of a good deal of pain. Sometimes the condition of the intestine is much the same as in chronic dysentery.

Severe gastric disturbance may be present, there is a tendency to great flatulent distension and even acute dilatation of the stomach, and persistent vomiting, rendering the feeding of the patient extremely difficult; this condition may be associated with severe headache. The term "bilious typhoid" is often applied to this form.

Jaundice occasionally occurs, usually in the later stages of the disease, and the cases often terminate fatally, the liver has been found in a condition of fatty degeneration, but the cause of the jaundice is somewhat doubtful.

Affections of the larynx and pharynx are not uncommon, sometimes a diphtheritic exudation forms on the fauces; this should perhaps be regarded as the result of a diphtherial infection and not as a manifestation of the typhoid poison. Sometimes herpetic ulcers are present, and cases have been described where circular or oval ulcers of larger size with greyish white surface have appeared on the soft palate.

Ulceration of the Larynx frequently occurs. The ulcers are usually situated on the posterior wall, and often extend deeply; they have been variously ascribed to an infiltration and ulceration analogous to that in the intestine, or to the effects of pressure from the decubitus of the patient. Sometimes they give rise to few symptoms, at others they cause hoarseness, and pain in swallowing, they may produce necrosis of the cartilages, œdema and stenosis of the glottis necessitating tracheotomy, or may perforate and give rise to emphysema of the tissues of the neck. Sometimes they cause hæmoptysis.

Besides bronchitis and hypostatic congestion, which are often present in severe cases, true lobar pneumonia occasionally occurs; it is most common in the third and fourth weeks. Embolic and pyæmic processes in the lungs may also take place, and may cause abscesses, or empyema or pneumothorax.

The tissues of the heart in severe cases of typhoid fever become granular and softened, sometimes giving rise to a certain amount of dilatation, but endocarditis is very rare. Not unfrequently, as the result probably of asystolism—i.e., a

condition in which the cavities do not completely empty themselves, coagulation takes place during life. This may cause sudden death from obstruction of the pulmonary artery, or may give rise to embolism of distant organs.

Thrombosis of the veins, especially of the iliac and femoral veins is of common occurrence; usually during the period of convalescence. The leg becomes oedematous, and there is pain and tenderness along the course of the affected veins, and often the vein can be felt as a solid cord. Most commonly, in a period varying from two to six weeks, the coagulum becomes absorbed, sometimes, however, the vein remains permanently blocked, and though the circulation gets carried on by the collateral channels, the patient continues to present some signs of venous obstruction of the limb.

Occasionally portions of the clot get dislodged and cause pulmonary embolism.

Renal Complications.—Albumen is often present in the urine in severe cases, but usually disappears with defervescence, but sometimes, though rarely, acute nephritis resembling that of scarlatina occurs, the urine becomes scanty, bloody, highly albuminous, or may be suppressed, and uræmia and dropsy may ensue. The term "nephro-typhus" has been given to this complication by foreign observers.

Sometimes, in addition to the ordinary nervous symptoms of severe fever—as tremors, subsultus, floccitatio, delirium—various spasmodic and paralytic affections occur, as general convulsions, muscular spasm, which may cause retraction of the head, rigidity of the trunk or limbs, strabismus, trismus. Sometimes acute meningitis has been set up, probably of septicæmic origin. Consecutive paralysis has frequently been observed. Sometimes there is hemiplegia from cerebral embolism, more often the paralysis is monoplegic or paraplegic, and must be ascribed to a peripheral neuritis; sometimes the attack is followed by various forms of sclerosis of the spinal cord. Occasionally there is a temporary aphasia, this has generally been noticed in boys. Mania or dementia have often followed an attack of typhoid, but are generally of only short duration.

The deafness of typhoid fever is usually only temporary, but sometimes inflammation of the middle ear takes place and may lead to perforation of the membrana tympani.

Bed-sores, abscesses in the connective tissues, sometimes erysipelas, and occasionally acute suppurative parotitis, or

parotid bubo occur. Sometimes during convalescence periostitis or more probably a superficial osteitis, often leading to suppuration and necrosis, affects many of the bones, especially the lower jaw, the sternum, the ribs, the femur and tibia. All these complications are probably septicæmic in their origin. Occasionally there is pyæmia, set up either by bed-sores or by the intestinal ulceration. This is usually characterized by recurrent rigors, but rigors may occur during the course of typhoid without any obvious cause.

Sometimes after an attack of typhoid the patients do not regain flesh and strength, but fall into a state of marasmus and continue to emaciate. This may be due to unhealed ulcers in the intestine and the persistence of the diarrhoea, in other cases to chronic atrophy or caseation of the mesenteric glands, and death may ensue after many months or even after years.

Sudden death is liable to occur either during the attack or when the patient is apparently convalescing; sometimes it is the effect of the granular degeneration and softening of the heart, or to embolism or thrombosis of the pulmonary artery; at other times no cause can be detected.

Relapses are liable to occur between two and twelve or fourteen days after the subsidence of the primary attack, but much longer intervals have been observed, even ten weeks. Fresh infiltration and ulceration of the intestinal glands take place, the rose spots again appear and all the symptoms recur. Most commonly the attack runs a shorter course, the fever attains its maximum sooner, between the fourth and sixth days, and defervescence begins before the end of the second week, but not infrequently the relapse lasts 21 or more days. Relapses are generally milder than the primary attack, but perforation is very liable to occur. Sometimes there is a second or even a third relapse. The relapse is often intercurrent—i.e., takes place before the subsidence of the primary attack, and is indicated by an exacerbation of the symptoms and the reappearance of the rash. The frequency of relapses has been estimated at from 3 to 10 per cent. The causes are very obscure, they have often been attributed to irritation of the intestine by improper food; but this is very doubtful. They certainly frequently occur where every precaution has been strictly observed. There is reason to believe that the germ of typhoid fever remains in the intestinal glands long after defervescence has taken

place, and may be excited to fresh activity.

DIAGNOSIS.—In consequence of its insidious onset and the somewhat indefinite symptoms at first, the diagnosis of typhoid fever in its early stage is often difficult. The main points which serve to distinguish it are the type of the fever, the tongue, the abdominal symptoms, as diarrhoea, distension, the enlargement of the spleen, and the rose spots. A temperature of 104° and upwards in the first two or three days of illness is more likely to be due to some other febrile disease, as pneumonia, meningitis, typhus or small-pox. So a normal evening temperature during the first week would generally exclude typhoid. Any fever in this country which lasts six or seven days without any local cause or the appearance of a characteristic rash is almost always typhoid, especially if the spleen be enlarged.

The diseases with which typhoid is most likely to be confounded are, first tuberculosis, especially tubercular meningitis and general miliary tuberculosis. In tubercular meningitis the vomiting is often more marked, the headache more severe and persistent, there is greater intolerance of light and sound, the tongue is not red, the belly often retracted, there is no enlargement of the spleen, the temperature is more irregular, the pulse often slow while the temperature is high, bowels usually constipated, motions have not the typhoid character. Sometimes tubercles can be detected in the choroid, there is often precedent emaciation. The knee-jerk is frequently absent, whereas in typhoid it is normal or exaggerated. Nevertheless, until spasm or paralysis of the cerebral nerves appears the diagnosis may be doubtful.

Acute miliary tuberculosis may also give rise to many of the symptoms of typhoid; there is, however, usually much greater rapidity of the breathing, and earlier and more severe bronchitic signs and greater emaciation.

Tubercular peritonitis, especially when associated with tubercular ulceration of the intestine may closely resemble typhoid, but the course is usually much more chronic; often there is peritoneal effusion, and signs of tuberculosis of other organs. In all these cases the presence of the rash is of the utmost importance, but a rash much resembling the roseola of typhoid is said to occur sometimes in acute tuberculosis.

Pneumonia is liable to be mistaken for typhoid, especially the asthenic forms,

which may no doubt be caused by septic infection. Generally the physical signs are a sufficient distinction, but as pneumonia itself is not a very uncommon complication of typhoid it may be difficult to decide whether it is primary or secondary; pneumonia, however, is a late complication of typhoid, and therefore the history and duration of the illness will generally distinguish them.

Typhlitis sometimes gives rise to symptoms like those of typhoid, but the presence of a swelling in the iliac fossa will distinguish it. This symptom is very unlikely to occur in typhoid, especially in an early stage.

Ulcerative endocarditis and pyæmia from internal causes may closely resemble typhoid, and in the former case may even produce intestinal hæmorrhage due to embolism. The greater irregularity in the type of the fever, the occurrence of repeated rigors (though rigors occasionally occur during the course of typhoid), the presence of some local inflammation, either internal or external, the signs of embolism, as purpuric spots, hæmaturia, hæmoptysis, and in ulcerative endocarditis the cardiac lesion, are the chief points of distinction.

In malarial districts, and especially in military practice during the exposure of a campaign, there is often great difficulty in distinguishing malarial and typhoid fevers, and there can be little doubt but that both forms may co-exist in the same patient.

For the diagnosis from typhus, see the latter fever.

PATHOLOGY.—Typhoid fever belongs to the class of miasmatic contagious fevers—*i.e.*, those fevers whose virus is capable of development outside the body, and which are usually communicated not by direct transmission from the sick to the healthy, but indirectly through the contamination of the soil or water.

In all probability the virus is associated with a specific bacillus described by Klebs and Eberth. The invariable presence after death, of this organism in the intestine, the mesenteric glands, the spleen, and sometimes the liver and in blood drawn from the spleen during life, has been verified by so many competent observers, that its connection with the disease can no longer be doubted. It is not met with in the general circulation, or in the secondary inflammations, which are probably septicæmic and not due to the direct action of the typhoid poison. The bacillus can be distinguished from all other organisms

by its mode of growth when cultivated on the potato, where it forms a uniform thin layer or pellicle. It has been detected in contaminated drinking water and cultivated. When introduced into rabbits and other animals, though it appears to multiply, and may cause death, it does not give rise to any disease which clinically can be identified with typhoid fever. The injurious effects on the human system are probably due to its generating some kind of poison of the nature of a ptomaine, which gets absorbed into the circulation. It would appear that the bacillus may remain in the intestinal glands for a long time after the subsidence of the fever. In one case it was detected in the discharge of an abscess, due probably to the breaking down of a mesenteric gland, five months after the commencement of the fever. Quincke also found that infection has been communicated by patients many weeks after defervescence.

The characteristic lesions of typhoid fever are an inflammatory affection of the solitary and agminate glands of the ileum and sometimes of the colon, and of the mesenteric glands, together with parenchymatous swelling of the spleen. The changes in the glands consist first of hyperæmia and swelling due to great hyperplasia or exudation of lymphatic elements. Peyer's patches in this stage form raised masses of a pinkish-grey colour, with reticulated, rugose, or nearly smooth surfaces, according as the inflammatory infiltration is uniform in all the tissues of the patch, or is greater in the follicles, or in the intervening structures. The solitary glands present similar changes. This stage is usually completed about the tenth day.

In the second stage necrosis of many of the patches takes place, giving rise to yellowish-brown sloughs, the separation of which occupies the third, and sometimes the fourth week also. There is left the typhoid ulcer, which is usually oval and opposite to the attachment of the mesentery, when it corresponds to a Peyer's patch, circular when to a solitary gland. Its surface is smooth, the edges undermined. Its depth depends on the extent of the original inflammatory exudation. Usually it does not go deeper than the mucous coat, but may reach the peritoneum and so perforate. As the ulcers heal, the undermined edges become adherent, the surface granulates, and ultimately the epithelium is restored, no contraction taking place. The healing of the ulcers takes an uncertain time,

it may be completed in a week or ten days. Sometimes the ulcers become chronic, and may continue to extend and give rise to the late hæmorrhages and perforations. These changes in Peyer's patches are always most marked and most advanced in the lower part of the ileum near the valve.

The mesenteric glands become swollen by a similar hyperplasia of their lymphatic elements, and sometimes they soften down and burst into the peritoneal cavity. Generally, resolution without necrosis takes place; sometimes they pass into a caseous condition. The spleen also presents a lymphatic hyperplasia with congestion, and it always contains the bacillus.

The other organs show more or less cloudy swelling of their cellular elements; this change is especially marked in the glandular epithelium. In severe cases the heart is more or less softened. Deposits of leucocytes are found in the liver; and here, too, the characteristic bacillus has been detected.

The voluntary muscles, especially the recti abdominis and the adductors of the thighs, usually show the changes known as "myositis typhosa," though they are by no means peculiar to typhoid fever; the muscular fibres lose their striation, become swollen and homogeneous, so as to resemble cylinders of wax, and then break up by transverse cracks into fragments and disappear, at the same time there is an interstitial exudation of leucocytes (Zenker's degeneration). Ultimately the fibre is regenerated by a cell-growth within the tube of sarcolemma. Sometimes this change causes muscular rupture and hæmorrhage during life, and is an additional reason for keeping the patient strictly at rest.

Deep ulcers which may lead to necrosis of cartilage are sometimes present in the larynx, usually on the posterior wall between the arytenoid cartilages. Bronchitis, lobular and lobar pneumonia and hypostatic congestion of the lungs are frequently met with.

ÆTIOLOGY.—Typhoid fever is chiefly disseminated by contamination of the air, or water, or food, by the specific typhoid virus which is contained in the intestinal discharges of persons suffering from the disease. The virus may retain its activity for an indefinite time in a suitable locality outside the body, and may possibly even multiply.

The most common ways in which it is communicated are :—

1. Inhaling effluvia from drains, cesspools, badly constructed water-closets, &c.

2. Contamination of the drinking water. This is the most common cause, especially of wide-spread epidemics. It takes place from soakage of sewage matter from cesspools into wells and springs, by contamination in various ways of ponds, reservoirs, even rivers of considerable size, as was the case in a recent epidemic at Zurich; contamination of house cisterns by the faulty arrangement of waste pipes; by the sucking back of sewer gas into water pipes, &c. The virus has often been distributed by milk. This is in all cases due to contamination of the water used for dairy purposes. Boiling destroys the virus both in milk and water. Outbreaks have also been attributed to eating the flesh in a state of putrefaction of calves affected by the disease.

Pettenkofer considers that contamination of the soil and height of the ground water play an important part, but it is probable that a low height of the ground water favours contamination of the water supply.

3. Direct contagion from the sick to the healthy. This probably plays but a small part in the dissemination of typhoid, and when it occurs it is probably through the medium of the stools. It would appear that the stools are much less virulent when first passed than after the lapse of some hours or days. Great care should be taken to disinfect all the discharges, to observe perfect cleanliness with regard both to the patient's person and the linen, and the attendants should never eat with unwashed hands. The linen soiled with typhoid discharges has frequently communicated the disease to laundresses. If the sanitary arrangements of a house or neighbourhood are defective, the introduction of a case of typhoid may easily cause an outbreak.

Although in civil practice in temperate climates outbreaks of typhoid can almost always be traced to some definite contamination acting in one of the above-mentioned ways, in military practice, especially during campaigns, typhoid fever appears to break out among unseasoned troops without it being possible to trace any source of infection, hence many military surgeons have come to the conclusion that it may arise *de novo*, and some have even denied its specific nature.

With regard to *predisposing causes*, typhoid fever occurs in all climates, but is most prevalent in temperate or sub-

tropical regions. In temperate climates it especially prevails during the autumn months, and is favoured by a hot, dry summer. It occurs at all ages, but is most common in young persons under the age of thirty. It is frequent in children. Age has much less influence on the mortality than in typhus, though it is more fatal in advanced life. It affects all classes of society, and occurs with equal frequency in both sexes. New comers into an infected district are generally supposed to be more liable than old residents. One attack confers a protection, though not a complete one, against a second attack.

TREATMENT.—The following rules are chiefly applicable to the more severe forms of the disease, but as concerns diet and general regimen, the mild and severe cases should be treated alike.

As soon as we have reason to suspect a patient is suffering from typhoid, he should at once be confined to his bed. A quiet, well-ventilated room should be selected and should be kept cool, and the covering of the bed should be light. The temperature of the room should not, if it can be managed, exceed 60° F. It is an advantage to have two beds in the room so that when necessary the patient can be shifted from one to the other. At least one trained nurse should be in attendance, and the patient must be watched day and night. He should never be allowed to get out of bed, especially after the middle of the second week, but should always use a bed-pan and urine bottle in the recumbent posture. Allowing the patient to get up to stool greatly increases the risk of perforation, hæmorrhage and fatal syncope. His temperature should be taken every four or six hours.

The diet is a matter of primary importance. During the prolonged fever great waste and consumption take place, not only of the fat, but also of the tissue-albumen, and though this cannot be altogether prevented, much may be done to limit it by a suitable diet, which must contain the necessary amount of fat, hydrocarbons and albumen. The last requires to be given in greater proportion to the other constituents than in health. At the same time the food must be given in a non-irritant, easily assimilable form. As a rule food should be given at least every three hours, and refreshing drinks, as lemonade, barley water, &c., may be taken in the intervals if the patient be thirsty and his mouth dry: Unless there is great prostration a longer

interval may be allowed during sleep. Often it is necessary to give food much more frequently. The food which best fulfils the indications for supplying albumen and fat is milk, and when it can be digested it should form the chief part of the diet. From 2 to 3 pints may be given in twenty-four hours. The stools should be observed to see that undigested curds do not pass. When this is the case the amount must be diminished. It may be given by itself or with arrowroot, barley water, thin gruel, rice water and soda water. Sugar may be added to the patient's taste. Beef tea, chicken broth, and other animal broths are useful, and should be given from time to time between the milk foods. Some patients can take without difficulty one to three eggs beaten up during the twenty-four hours, though many are unable to digest them. When milk cannot be digested in sufficient quantity it is often difficult to introduce sufficient albuminous and fatty matter for the wants of the system. Beef tea made in the ordinary way, though no doubt a useful stimulant, cannot be looked upon as supplying much nourishment; we may have recourse to solutions of meat extract by cold water and hydrochloric acid, or the various meat juices and peptonised meat jellies which are so largely manufactured. These should be added to the beef tea. When milk cannot be otherwise digested, Nestlé's food, made thin, can be tried, or the milk may be peptonised.

Severe cases of typhoid fever necessitate the free administration of alcoholic stimulants; the amount will depend on the age, the previous habits, and the actual condition of the patient.

Older subjects need them more than younger ones, free drinkers more than temperate persons. The especial indications for their use are a dicrotic pulse, feeble cardiac impulse, short and faint first sound of the heart, muscular prostration, subsultus tendinum, dry brown tongue, and muttering delirium. The best form is brandy, which should be given well diluted at regular intervals. The amount required may vary from a few ounces to twelve or more in the twenty-four hours. To tide over a period of temporary collapse perhaps the best stimulant is ether administered subcutaneously, 30 to 60 minims at short intervals. The less severe forms of typhoid, especially in young persons, do not require alcoholic stimulants.

The next point is the treatment of

the febrile condition. Very different opinions are entertained as to the effect on the system of the high temperature of fever. Some regard it merely as an indication of the severity of the disease, but as not in itself exercising any injurious influence, nay, as possibly a conservative process. Others consider that it has a most injurious influence by increasing the febrile combustion and disintegration of the tissues, and by impairing all the functions of the body, especially those of the nervous and circulatory systems. There can, however, be no doubt in the minds of those who have observed the effects of systematically reducing the temperature in typhoid, especially by the external application of cold, that by this means the disease is made to run a much milder course, and that the mortality is greatly lessened. Under this method of treatment, if begun sufficiently early, the so-called typhoid symptoms, delirium, &c., are seldom seen. It is, however, very probable that the mere reduction of the temperature is only one factor in the treatment, and the good results are largely due to the stimulating effect on the nervous and vascular systems, by which the tone is restored to the relaxed vessels, and then to the paralysed heat-regulating centres.

By far the most effectual way of applying this treatment, when circumstances permit, is by tepid baths, and as a rule whenever the temperature exceeds 103° F. the patient should be lifted into a bath of a temperature from 85° to 80° F. The duration of the bath must vary with the condition of the patient and the obstinacy of the temperature, generally from fifteen to twenty or thirty minutes are necessary. It is sometimes advantageous to lower the temperature of the water after immersion, but it is not, as a rule, advisable to begin with a temperature below 80° F. At this temperature the bath is generally agreeable to the patient's feelings, though towards the end he usually begins to feel shivery. Brand, as is well known, obtained the most successful results by baths of 65°, but his cases were mostly soldiers—i.e., strong young men in the prime of life.

The treatment by tepid baths is especially indicated in the acute forms of the disease and during the earlier stages; the more completely the fever is held in check during the first fortnight the less severe will be symptoms during the third week. Hæmorrhage or peritonitis is of course an absolute contra-indication, and

when towards the end of the fever the morning temperature begins to fall below 100° we may safely neglect a high evening temperature. We should administer a stimulant to the patient before each bath. As substitutes or adjuncts to bathing are cold sponging, cold compresses, and the cold pack; the two former may be used when, from the want of sufficient assistance, bathing is impossible, or when in the third week from the occurrence of hæmorrhage, or from fear of perforation, we do not like to move the patient.

Temperature may also be reduced by various drugs, the most important of which are quinine, antifebrine (acetanilide), and antipyrine (dimethyloxy-chinizin), and there can be little doubt but that when judiciously employed they have a beneficial action; it is however very doubtful whether in a long fever like typhoid they can be safely used continuously as a substitute for bathing.

In order to produce a decided fall of temperature quinine requires to be given in doses of from 10 to 25 grains, and should not be administered oftener than once in twenty-four to forty-eight hours. It is liable to cause sickness, to prevent which a little opium may be added. Perhaps the most convenient form for these large doses is the hydrobromate. It is, of course, liable to cause the usual disagreeable effects of cinchonism. It is best adapted for the later stages of the fever when the temperature is assuming a more remittent type. Antifebrine is to be preferred to antipyrine; smaller doses are required, it is less depressing, and is not liable to cause a measly rash. Like the former drug it often produces profuse perspiration, though its antipyretic effects do not appear to be due to this. The requisite dose does not usually exceed 5 grains. It is best given dissolved in rectified spirit and added to warm water. An occasional dose will much increase the effect and enable us to diminish the frequency of the baths, and it may be employed where baths are contra-indicated. It must be borne in mind that all these remedies if pushed beyond moderate limits have a depressing effect on the heart.

Recently the practice has been introduced of treating typhoid fever by antiseptic remedies, in the earlier stages with the intention of destroying or weakening the specific typhoid virus, in the later with the hope of preventing the septi-

cæmia caused by the sloughy condition of the intestinal glands. Their efficacy for either purpose is still very doubtful.

Complications and Special Symptoms.—These are numerous and require careful treatment. If the diarrhœa be only moderate in amount it need not be interfered with, if the number of motions exceed four daily, it should be held in check. The best remedy is opium, which may be advantageously administered as an enema. Where there is constipation a small enema may be administered from time to time to unload the rectum; for this purpose glycerine is often useful, but purgatives should never be given after the end of the first week. It is the custom in Germany to commence the treatment with one or two doses of calomel, and this is said to render the subsequent course milder.

If a profuse hæmorrhage should occur our aim must be to keep the bowel perfectly at rest; the patient should not be allowed to move from the recumbent posture. It is best for him to pass his motions into a draw sheet, and no food should be given for some hours. If there be danger from collapse a little cold brandy and water may be administered or a hypodermic injection of ether. An ice bag or an ice compress may be applied to the abdomen. The only drug of much use is opium, which arrests peristaltic action. It should be given in full doses, either by the mouth or in a clyster, or hypodermically as morphine. Many practitioners also administer styptics, especially gallic and tannic acids, turpentine, ergot, the latter hypodermically, but their utility may be questioned.

Peritonitis requires full doses of opium or morphine subcutaneously, and food should only be administered in very small quantities. If the temperature be high a cold compress should be applied to the abdomen; when not due to perforation, peritonitis admits of recovery. If we are satisfied that perforation has taken place, from the sudden onset of pain in a particular region, collapse, the presence of gas in the peritoneal cavity, the treatment will depend on the period of the disease; if, during convalescence, the peritoneal cavity should be opened and washed out, and the perforation excised, and the bowel stitched up. This operation has been successfully performed, and affords a sufficiently fair prospect of remedying an otherwise fatal accident. If, however, perforation takes place during the third or fourth week, when the

bowel is sloughy and the patient still under the influence of the fever, the prospect must be regarded as almost desperate. In one case where the operation was performed at this stage, the patient died collapsed within five hours, and the stitches in the bowel were beginning to slough. If it should be thought advisable to attempt an operation, it is evident that no endeavour should be made to excise the perforation, but the gut should be brought to the surface of the wound and allowed to discharge externally.

Meteorismus is a dangerous and distressing symptom and one which it is very difficult to overcome; an ice bag or iced compresses to the surface of the abdomen, the administration of stimulants and opium are useful measures. Ziemssen recommends a turpentine enema. Attempts have been made, sometimes with success, to draw off the gas by a long narrow rectal tube or elastic catheter.

Obstinate vomiting in the bilious form of the disease must be combated by ice, by limiting the food and by subcutaneous injections of morphine. Sometimes it becomes necessary to desist from food and to administer nutrient suppositories.

Pulmonary complications, as hypostatic congestion, lobular and lobar pneumonia, which latter are probably of septicæmic origin, require stimulants. Counter-irritation may be used in the form of turpentine stupes, and stimulant expectorants, as ammonia and turpentine, may be given.

Sleeplessness and delirium are best relieved by tepid baths, we should also give opium in moderate doses, or a subcutaneous injection of morphine; other hypnotics may be tried, but as a rule opium agrees best. It is of great importance not to allow the patient to pass restless, sleepless nights.

The other complications must be treated on general principles. Bed-sores must be guarded against by great cleanliness; sponging the back with spirit lotion, the early use of a water mattress, the bladder also must be carefully attended to.

Great care is needed during convalescence; we have especially to guard against the too early resumption of solid food; three or four days should elapse after the evening temperature has fallen to the normal point, before any solid food is given, and a longer interval may be necessary if the signs of ulceration continue; but it must be remembered that in order to get atonic ulcers to heal ample

nourishment is necessary. The patient should begin with a rusk and a lightly poached egg, then a little boiled fish, and then chicken. Bread, potatoes, and other vegetables should not be allowed at first. The patient should not sit up too soon for fear of causing fatal syncope. If thrombosis occur, the leg should be kept motionless by sand-bags on each side, and belladonna ointment and hot fomentations may be applied along the course of the vein, if there be pain.

Persistence of the diarrhœa is often due to ulceration of the large intestine. Astringents are now useful, especially the metallic ones, as lead and copper, combined with opium.

W. CAYLEY.

TYPHUS FEVER.—An acute specific infectious fever, distinguished by its sudden onset, by a peculiar rash, which usually appears on the fifth day of the disease; by profound prostration accompanied by cerebral disturbance, and by its termination by a crisis which most commonly occurs on or about the fourteenth day.

Symptoms.—The incubation period usually lasts twelve days. The onset is well marked as a rule, and may be sudden. Shivering, frontal headache, loss of energy and of appetite, severe aching pains in the limbs and back, thirst and constipation are generally the earliest symptoms. The tongue is pale in colour, covered at first with a thin white coating, later on plastered and finally often encrusted, as are also the teeth, gums and lips, the latter being usually dry and cracked. The colour of the coating changes, as the disease advances, to yellow, and finally to brown, or even black in severe attacks.

Early in the disease the patient takes to his bed and lies low down in it, flat on his back. He looks vacant, dull, and apathetic, and is careless of his fate. His eyes are half shut, the conjunctivæ injected, and the mouth not firmly closed. A dull red flush covers the face.

Usually on the fifth day, but in some cases on the fourth, sixth, or seventh, the *rash* appears, the percentage of attacks in which it is absent being very small. It consists of a subcuticular mottling and of very slightly raised "spots," but both are not always present in the same case. The mottling varies in character in different cases; in some having the appearance of a marbling, in others seeming to be made up of spots similar to those visible upon the surface, but

dimmed by being seen through a partly transparent layer. The "spots" much resemble those of measles, and when very numerous may be similarly grouped, but their size is smaller and their distribution different, the typhus rash being very seldom seen upon the face. Their colour is at first pink or red, and fades upon pressure, but in the majority of cases soon becomes browner and persistent, in some petechial. The spots may be very few in number, and the rash easily overlooked, or there may be an abundant crop. It is found chiefly on the sides of the chest and abdomen, on the arms and on the back, in which latter situation, as on the dorsal surface generally, the colour is usually darker. The legs may be invaded by the rash. The dull red flush usually seen upon the face sometimes covers the whole surface. The rash does not appear in crops as in enteric fever, but attains its maximum development in a few days. Sudamina and miliaria are not uncommon, though the skin is usually dry.

A distinctive odour is said to be given off from the skin, but it is doubtful whether it is sufficiently characteristic to be of any use for diagnostic purposes.

As a rule, headache is present during the first week of the illness, delirium during the second. The latter is commonly of the stupid, muttering kind, more rarely of the violent or erotic. In grave cases coma or coma-vigil may supervene. Deafness is a common symptom. Other affections of the nervous, or nervous and muscular systems, come on for the most part towards the end of the attack, and are presumably due to the exhausting effect of the fever. Of these muscular tremors, paralysis of the bladder and rectum, and in very severe cases subsultus, carphology, and hiccough occur most frequently. Convulsions, which are said to be usually uræmic in origin, are seldom followed by recovery.

Of the digestive organs the state of the tongue has already been mentioned. Abdominal distension, or tenderness, and vomiting have been observed in a small percentage of cases, but the tenderness may often be ascribed to an enlarged liver and spleen.

The urine is usually diminished in quantity, dark in colour, of high specific gravity, and albuminous. The presence of albumen or blood is seldom of serious import unless in large quantity, or associated with a very marked diminution of the excretion. Urea is in excess,

although its elimination is probably defective. The chlorides are sometimes absent and usually deficient.

The action of the heart is much impaired, the impulse being rendered feeble and the first sound weak. The pulse is rapid, soft, and compressible, full at the beginning of the attack, small and weak as the end approaches. Its rapidity varies as a rule with the gravity of the case, seldom exceeding 100 in a mild one, but rising to 140, 150 or even more in a very severe one. In a few instances, a remarkable slowing of the pulse has been noticed.

Hypostatic congestion of the lungs occurs in all but very mild cases.

The *temperature* may be considerably elevated even on the first day, and often attains its maximum by the third or fourth day of the attack, keeping nearly at the same height until about the seventh day, when, unless the type be very severe, there is a fall, and the average temperature during the second week is lower than during the first. About the fourteenth day, if all go well, the crisis usually occurs, the temperature rapidly declining to the normal. In some cases it rises again after the critical drop and then falls gradually. Complications may alter the course of the fever, and in fatal cases death is often preceded by a rapid rise, or by a fall of the temperature to a point much below the normal. The average morning remission is stated to be $1\frac{1}{2}^{\circ}$ F.

Complications and Sequelæ.—Of the former, bronchitis and pneumonia are the most common. Gangrene of the lung is much rarer. Venous thrombosis and pyæmia sometimes occur (either as complications or as sequelæ); meningitis hardly ever. Of sequelæ, gangrene is the most frequent, either in the form of bed-sores, or of necrosis of the tips of ears, heels or nose. The gangrene commencing in the feet may extend up the legs. The marked inefficiency of the circulation and the tendency to thrombosis easily accounts for these and other forms of gangrene. The corneæ sometimes slough. Buboës often form in the parotid and axillary glands, in those at the angle of the jaw, or in the groin. Paralysis of various muscles may supervene and the patient may be left in a state of temporary mental imbecility. So profound are the changes in the organism which must necessarily be brought about by the fever, when severe in type and affecting persons already weakened by privation and unhealth,

surroundings, that almost any sequelæ may be expected.

Termination.—If the patient live long enough the disease ends by crisis or by a mixture of lysis and crisis, but death may follow later on from persistence of complications or from sequelæ. Death from the primary fever occurs usually towards the end of the second week and by exhaustion or coma, or both combined.

Diagnosis.—At the onset of the attack the case may be mistaken for one of pneumonia, meningitis, variola or enteric fever, but in a few days all except the last of these diseases may be excluded. If, as sometimes happens in typhus, there be no rash and the attack be a mild one, it may not be possible to ascertain whether the case be one of typhus or of enteric fever without rash and terminating abruptly at the end of the second week.

At the eruptive period enteric fever may simulate typhus, if the onset be more sudden than usual, the rash very profuse, and if there be constipation and delirium. In some instances the rash of measles is not unlike that of typhus, but the spots are larger and more conspicuous in the former disease and the pre-eruptive symptoms quite different. Malignant variola is often confounded with typhus, but in the former the rash appears early, in no way resembles that of the latter, and is accompanied by sub-conjunctival and other hæmorrhages, but not, as a rule, by pyrexia.

Prognosis.—The chief factors which have to be taken into account are the age, sex and mode of life of the patient, the intensity of various symptoms, and the type of the epidemic. The average mortality at all ages is 15 per cent., but it varies from 2 per cent. or 3 per cent. between the ages of ten and fourteen, to about 75 per cent. at seventy, and to a still higher rate above that age. In children under ten years old the case-mortality is higher than in the next ten years of life, but with this exception the percentage of deaths increases steadily with increasing age. The mortality is greater in males than in females. Intemperate habits, destitution and debility, and the general impairment of health caused by unhygienic surroundings, will of necessity lessen the patient's chance of recovery. Of unfavourable symptoms the chief are: high average temperature and pulse rate, failing heart, severe lung affection, delirium with

sleeplessness, carphology, general convulsions, great distension of the abdomen and deficient elimination of waste products by the kidneys, especially if there be much albumen or blood in the urine. A very dark-coloured and profuse rash is also a sign of great danger.

Post-mortem Appearances.—Rigor mortis is not well marked. The blood is dark and fluid or forms but soft clots, which rapidly decompose, as also does the body generally. The liver and spleen are large, dark, soft and congested. The kidneys may show signs of acute inflammation. Peyer's patches are not swollen or otherwise affected. The heart is fatty and friable. In addition all organs show signs of the degeneration which is caused by continued fever. There is no distinctive affection of the brain or its coverings.

Ætiology.—Although no germ which can be looked upon as the exciting cause of typhus has as yet been discovered, the character of the disease renders it almost impossible to doubt the existence of such a microbe.

The best known predisposing causes are dirt, overcrowding, famine, fatigue, certain climatic conditions, and personal predisposition or susceptibility. Some of these may act by providing the germ with a better soil for its maintenance outside the human body; some by increasing the number of germs which can obtain access to it, and others by lessening the resistance to the germs effecting a lodgment, or producing conditions more favourable to their multiplication within the body.

Treatment.—The patient, both for his own sake and for that of his attendants, should be placed in a well-ventilated room. If possible, nurses who have had typhus fever should be procured or, if this be impracticable, only young nurses should be employed. The room should be kept cool and the bed-clothing light, but the patient's extremities should be kept warm. A combination of hair mattress and close-woven wire mattress forms the best bed, unless the attack of fever be very severe, in which case it is better to place the patient on a water bed at once. He should never sit up, but his position in bed should be often altered.

Food should be given at short and regular intervals, and should consist of milk, eggs, meat-juice or peptonized beef-jelly, and in most cases alcohol. Water and other diluents may be given in moderation.

As medicines, the mineral acids and

sodic chloride have been recommended, and tea, coffee or caffeine may be of use if it become necessary to stimulate the kidneys. Complications may be treated by the ordinary methods.

The ill effects which are produced by the continuance of a high temperature may be minimized by antipyretic treatment. Cold baths or sponging, antipyrin or acetanilide are the most commonly used means to this end. The first named is especially useful for inducing sleep. When the temperature has fallen to the normal the patient's appetite quickly returns and solid food may

be given. During convalescence care should be taken not to overtax the strength either of mind or body.

At the conclusion of the illness thorough disinfection should be carried out.

E. O. HOPWOOD.

TYROSIN, like leucin, is a product of the decomposition of nitrogenous bodies, and is never found except in association with leucin. It is present in the liver and in the urine in cases of acute yellow atrophy of the liver, and appears under the microscope as fine, colourless needles.

U

ULCERATIVE COLITIS AND ENTERITIS.—Ulceration of the intestine most commonly arises in the course of certain diseases, and is referred to under the appropriate headings (*see* **INTESTINES, TUBERCULAR DISEASE OF, TYPHOID FEVER, DYSENTERY, DUODENUM, ULCER OF**). The following affections are described in this article:—

- A. Simple Ulcerative Colitis.
- B. Follicular Ulceration.
- C. Distension Ulcers.
- D. Ulceration due to Vascular Obstruction.
- E. Stercoral Ulcers.
- F. Ulceration due to Perforation of the Intestine from without.
- G. Catarrhal Ulcers.
- H. Neurotic Ulcers.

A. Simple Ulcerative Colitis.—A disease, without obvious cause, which is characterized by severe symptoms, and by a peculiar form of ulceration attacking chiefly the colon.

Symptoms.—The onset is insidious, diarrhoea, which begins gradually, being the most striking and constant symptom. The bowels are ultimately open very frequently, sometimes every two hours. The motions are fluid, the colour is very various, depending much upon the amount of blood present, which, however, is not thoroughly incorporated with the motions. These are never dysenteric, and probably never contain pus; the amount of fecal matter is small, sometimes there is a little mucus and sometimes the odour is offensive, and in rare cases an occasional slough may be seen. The diarrhoea very often alternates with constipation, lasting two, three or four days at a time. In about a third of the

cases there is some vomiting. Abdominal pain is usually present from the beginning of the illness, but it bears no relation to the ingestion of food. Abdominal tenderness is exceptional. The usual course is for the patient soon to become sallow, to waste and to get weaker, and finally, to die collapsed in about eight weeks, with a subnormal temperature and a feeble pulse. The disease is uncomplicated by any other malady, but chronic Bright's disease was present in three out of eleven fatal cases. It may kill by perforation of the intestine.

Diagnosis.—The rarity of the disease and want of knowledge concerning it make it quite likely that slight cases very often pass unrecognized. In severe cases the character of the motions and the absence of an exciting cause separate it distinctly from dysentery. The duration and the alternating attacks of constipation distinguish it from simple diarrhoea. Especial care must be taken to avoid confounding it with intestinal obstruction; in one case the severe vomiting, the collapse and the fact that the bowels had not been open for a few days led to this mistake, which was corrected by an enema, which first brought away scybala and subsequently caused the passage of much fluid motion and flatus. In another case motions full of blood, abdominal pain, and the fact that an ulcer could be felt per rectum led to the diagnosis of malignant disease of the intestine. The diagnosis from follicular ulceration will be considered under that heading.

The *prognosis* is very grave; if the patient die, it is usually about eight weeks from the time when the symptoms

began, occasionally, however, the malady is fatal in a few days.

Pathology.—In a typical case, the muscular coat is exposed, and the ulceration is so extensive that only islets of mucous membrane are left here and there. Often these are considerably swollen and consequently they look taller than they otherwise would, and frequently they are more or less sessile, because the irregular ulceration undermines them. The result is that a careless observer concludes that the islets of mucous membrane are polypoid growths and the exposed muscular coat is the natural level of the colon. The vessels of the mucous membrane are dilated, and sometimes it is black as though from long-standing congestion. The muscular coat is hypertrophied. Sometimes perforation occurs and sets up peritonitis. Usually the large intestine is the only part of the gut which is affected, but in some cases enteritis and ulceration are present in various parts of the small intestine. Even at the autopsy sloughs are exceptional, from which we may conclude that the dead tissue is discharged as small shreds. Generally there is no attempt at repair, but one case is recorded in which, while one part of the bowel was severely ulcerated, pigmented spots in other parts were very suggestive of healed ulcers. As a rule, Peyer's patches are healthy, but in some cases they may be slightly swollen. Enlargement of the mesenteric glands is very rare. Constriction of the bowel and plugging of the mesenteric vessels are unknown. In the majority of the cases the rest of the body is healthy, but in some the kidneys have been granular.

Ætiology.—The disease is not dysentery; the clinical differences are so well marked that this is certain, although in some cases there may be a resemblance in the pathological anatomy of the two conditions. Some have considered that the ulceration begins in small submucous collections of pus, which burst and discharge, but this is not so; others have thought that it commences in the solitary follicles. The reasons against this view will be given presently under the head of follicular ulceration. On the whole the most probable hypothesis is that the disease begins as a catarrh of the intestinal mucous membrane. Of the ultimate cause we know nothing. It is commoner in men than in women, in the proportion of eight to three. It never occurs in childhood, but usually between 35 and 55 years of age.

Treatment.—The best hope for the patient lies in abundance of easily digestible food, peptonised if necessary, so that there may be as little fecal matter as possible to irritate the ulcerated surface, hence the patient should take little but milk in small quantities each time, but at frequent intervals, and any alterations in diet which may be resorted to during convalescence must be made very gradually. He should be kept under the influence of opium, as it is probably the best drug for restraining the diarrhoea. Usually he is better for some alcohol.

B. Follicular Ulceration.—This variety is frequently found in patients who die of exhausting diseases, sometimes, therefore, it complicates malignant diseases of the intestines, typhoid fever and tuberculosis, and thus cancerous, typhoid or tubercular ulcers as well as follicular ulcers, may be present at the same time. The condition is far more common in the large intestine than the small, it consists in the disintegration of the solitary follicles, the result being many small round ulcers with sharply cut edges, not at all undermined and not extending deeply. In a well-marked example the gut is quite honeycombed. No attempt at healing can even be seen, therefore there is no cicatrization. Perforation does not occur. The mucous membrane between the ulcers is usually not affected at all, but it may be slightly inflamed. It is doubtful whether these ulcers are of themselves capable of causing death, and no symptoms can for certain be attributed to their presence. The distinctions between simple ulcerative colitis and follicular ulceration are the following: (a) the appearance of the two conditions is quite different; (b) the two forms of ulceration are never seen to pass one into the other; (c) in simple ulcerative colitis the follicles are not described as affected, and when the small intestine is ulcerated Peyer's patches are rarely implicated; (d) simple ulcerative colitis is usually uncomplicated, and is generally the sole cause of death; follicular ulceration is usually a complication of some exhausting disease and is never the sole cause of death; (e) perforation of the intestine occurs in simple ulcerative colitis, but not in follicular ulceration; (f) chronic Bright's disease is the commonest complication of simple ulcerative colitis, but it is very rare in association with follicular ulceration; (g) other intestinal lesions are common in follicular ulceration, but are very exceptional in simple ulcerative colitis.

C. Distension Ulcers.—Whenever there is any obstruction of the passage of the intestinal contents, the distended gut behind the seat of obstruction is very liable to become ulcerated. The exact mechanism of the production of these ulcers is not known, probably they are due to irritation of the coats of the intestines by its contents. There is nothing particularly characteristic about the ulcers as regards their shape and position. They begin as small superficial erosions, and if the obstruction lasts long enough they, like all chronic intestinal ulcers, tend to become transverse to the long axis of the bowel. They may slough and lead to perforation of the gut, or may extend so deeply as to set up peritonitis without perforation. Usually, but not always, they are immediately above the seat of obstruction. The furthest distance above the obstruction in cases observed by the writer was six feet. The ulceration furthest from the obstruction is usually the least severe, and if recovery take place the first to heal. The obstruction must last some time for ulcers to form, but the writer has found them in abundance nine days after the onset of acute obstruction. The lymphatic follicles are not more liable to be ulcerated than any other part of the intestinal wall.

D. Ulceration due to Vascular Obstruction.—Severe ulceration of the intestine is sometimes due to a growth pressing upon the mesenteric vessels, and sometimes to vascular obstruction from atheroma, thrombosis, or plugging by infarcts of the mesenteric arteries. Our knowledge of this condition is too scanty for us to say whether there is anything characteristic in this variety of ulceration. It is interesting to observe that it may be transverse even when not chronic; possibly this is due to its following the distribution of the vessels. Strange to say, although the inner coats of the bowel are inflamed and ulcerated, the peritoneum usually escapes, and thus peritonitis is generally absent. It is an interesting fact that the ulceration may be severe without producing any symptoms.

E. Stercoral Ulcers.—In cases of long-standing constipation, especially if it be severe enough to constitute fecal impaction, the irritation of the hard masses of feces leads to the formation of small ulcers. These do not produce any symptoms and usually heal when the constipation is overcome; they, and the intestinal catarrh which accompanies them,

are the cause of the diarrhœa, which may persist for a few days after the removal of the feces in a case of fecal impaction.

F. Ulceration due to Perforation of the Intestine from without.—This is an extremely rare condition seen in those cases of chronic peritonitis in which a number of small localized abscesses have formed between the matted coils of intestine, which, bursting into the gut, form a number of small rounded ulcers.

G. Catarrhal Ulcers.—Some authors, as, for example, Leube and Nothnagel, describe simple catarrhal ulcers, which may begin with simple lesions of the epithelium, or as minute collections of pus, which burst and give rise to small ulcers. This form of ulceration is decidedly rare, and nothing is known of the symptoms which it produces.

H. Neurotic Ulcers.—It has been suggested that ulcers due to nervous diseases may form in the intestine just as a perforating ulcer forms in the foot, but on this subject we have no information of value.

In certain cases severe ulceration of the intestine, which cannot be referred to any known group, is found on autopsy.

W. HALE WHITE.

URÆMIA.—A condition caused by the retention within the body of poisonous products which should be eliminated by the kidneys.

Symptoms.—The animal organism is a laboratory in which poisons are being constantly generated. Many of these are eliminated by the kidneys as rapidly as they are formed. If, however, from any cause these organs make default, or if there be any prolonged obstruction to the outflow of urine, accumulation of some or all of the poisons takes place, and characteristic symptoms are manifested. But the accumulation may be very slow, and the earlier symptoms, corresponding to the comparatively small dose of poison, may be but slight; yet they are in kind, though not in degree, as indicative of uræmia as are the more alarming ones which appear towards the end, and to which alone the name of uræmia is often given. Not only from the varying rapidity of this accumulation, but from other causes to be mentioned, will the symptoms of different cases of uræmia vary greatly. Whatever be their nature or intensity, however, they always point to an intoxication, and most frequently to an intoxication of the nervous

centres. Facts now established by experiment are gradually helping to explain many of the anomalies arising from the widely different clinical pictures presented by different cases. Thus, from healthy urine Bouchard has obtained at least seven distinct poisons, of which two are convulsivant, one diuretic, one narcotic, one sialagogue, one pupil-contracting, and one temperature-reducing. He has further shown that these poisons are produced in different relative amounts at different periods; for whereas the night urine contains so large a proportion of the convulsion-producing substances as to make it predominantly convulsivant, the day urine has more of the narcotic poison and is hence soporific in its action. In diseased conditions there is evidence of the formation of yet other poisons over and above those produced in health. Taking all these facts into consideration, and remembering the occasional deviation from the usual symptoms in cases of poisoning by a single substance like arsenious acid, depending probably upon the special reaction of the individual, there is no longer room for surprise at the anomalies presented by uræmia. There is good evidence, too, that poisonous alkaloids, such as xantho-creatinine and others, whose nature is only now beginning to be studied, are formed within the animal body in health and still more in disease, and that they, if retained, as they are apt to be in derangements of the kidneys, produce special toxic effects.

One of the earliest and most constant of all the symptoms is vomiting. It is seldom entirely absent, and sometimes is so frequent and persistent as ultimately to lead to death by exhaustion. In such cases the nervous system usually remains unaffected throughout, neither muscular twitchings, convulsions, paralysis, coma, nor other nervous symptom appearing. The writer has seen this not only in cases of acute and chronic parenchymatous and interstitial nephritis, but in permanent plugging of both ureters. No special poison having emetic properties has as yet been obtained from urine, but urinous products are certainly at times excreted freely by the gastric mucous membrane in uræmia; and when there is such excessive vomiting the amount of liquid thus discharged seems often to be in excess of what is ingested. The patient under such circumstances wastes rapidly, even if sustained by nutrient enemata.

Much more frequently, however, the

retained poisons affect the nervous centres, headache or various disturbances of special sense, especially of the sight, convulsions, coma, paralyses, or nervous dyspnoea of asthmatic type, with, at the same time, always some amount of vomiting, occurring alone or variously combined, and presenting various clinical pictures allied to those of alcoholic intoxication, epilepsy or apoplexy, but always distinguished by the fact of a relation to antecedent renal trouble.

As to the mechanical theories of uræmia, such as cerebral anæmia, or œdema, or plugging of arteries, it is not necessary to do more than allude to them here, for although cerebral œdema and anæmia are doubtlessly often present, and when present must produce symptoms, it is equally certain that they are often absent, and that the only constant and invariable factor is the retained urinary poisons. One must not omit to mention among the signs of the uræmic state unpleasant and sickening odours both from lungs and skin, which are sometimes recognizable on approaching the patients' beds. Volatile poisonous products are probably discharged from the lungs and skin to the partial relief of the patient.

The relation of the amount of total daily urinary products to the body weight of the individual is a matter of great importance, and where for several successive days the proportion falls below what is normal, some significant symptom or symptoms of poison will certainly appear. If the kidney be contracted and the heart large, besides the headache and epistaxis, which may simply result from heightened blood-pressure, vomiting is almost certain to occur, or irritating cutaneous eruptions. Later on sight may suddenly disappear and as suddenly reappear, the ophthalmoscope revealing no change in the fundus oculi.

Uræmia, as manifested by one or more of the symptoms mentioned, may occur in all forms of Bright's disease, but it is only in the acute parenchymatous inflammations of the kidney, such as those following scarlatina, that it is ushered in very suddenly and sometimes with overwhelming violence, convulsions, coma, and death succeeding each other in a few hours. In most, if not all other conditions, there are significant warnings that should prevent us from being surprised by the patient lapsing into stupor or some similarly alarming state.

The safe plan is to regard the earlier and slighter symptoms, not as indicative

of a condition that may lead up to uræmia, but as indicating uræmia itself.

Treatment.—How far can the uræmic condition be combated? The four great sources whence the urine derives its toxicity are:—(1) Aliments, and especially their potassium constituents; (2) the absorbed products of intestinal putrefactions; (3) secretions, such as bile, &c.; and (4) tissue disintegrations. We can control the food, disinfect the intestinal contents, limit the secretions, and to an extent check disintegrations, and by all these means do good. Milk contains but little potassium compounds, requires but a small amount of bile for its digestion, and is closely allied to healthy blood. Milk is hence the best diet. By the use of such drugs as salol, or Bouchard's well-known mixture of naphthaline, iodoform, and animal charcoal suspended in glycerine and water, we can disinfect the intestinal contents. In very acute cases, such as those following scarlatinal nephritis, a free bleeding will often abstract enough of the poison to restore the patient from an apparently desperate condition and even permanently cure him. Freë purgation will almost always give relief; while transfusion has, in extremely critical cases, occasionally warded off death for some time. Experience has fully shown the value of free purging and diaphoresis; while there is a growing evidence that increased oxidation, obtained by active exercise, when the condition of the patient permits this to be taken, by the employment of the compressed air bath, or by the inhalation of oxygen itself, is useful instead of injurious.

When the pupils are dilated and the preponderating physiological effects of the retained urinary poisons are like those of atropine, the hypodermic injection of morphine is of the greatest advantage. Where purgation is required, but vomiting is persistent, the slow introduction of the enema magnesi sulphatis will produce a copious evacuation in from five to seven hours.

WILLIAM CARTER.

URETHRA AND BLADDER, FEMALE, DISEASES OF.—Dilatation of the Urethra is occasionally met with. It has been produced by the passage of calculi or tumours; by excessive dilatation for surgical purposes; by the introduction of foreign bodies by the patient herself, by lupous ulceration; and there are cases in which the urethra appears congenitally of unusual capacity.

The condition gives rise to irritability of the bladder, or in the worst cases to incontinence of urine. In simple congenital largeness there are no symptoms, or they are slight only.

Treatment.—The best treatment is to insert a bulbous actual cautery into the urethra for a second or two, so that a small slough may be produced, and the resulting cicatrix contract the urethra. In bad cases treatment is very unsatisfactory.

Partial or Saccular Dilatation of the Urethra (*Urethrocele*).—This condition is rare. Such diverticula as are of any size are produced by cysts which have opened into the urethra. The diagnosis and treatment of these is described below under Dermoid Cysts. Saccular dilatation of the urethra, independent of a cyst in its wall, is exceedingly rare, does not reach a high degree, nor, when uncomplicated, cause any symptom.

Prolapse or Inversion of the lining membrane of the urethra, or even of the bladder, is occasionally met with. The latter is the rarer. It seems to be associated with congenital largeness of the urethra. Prolapse of the urethral mucous membrane occurs usually in children, as a result of some straining effort, such as a violent attack of coughing. It forms a sort of deep red frill round the urethral orifice. The protruded part quickly becomes congested, deep red or purple in colour, and readily bleeds, but is not very tender.

Treatment.—The protruded part should be cut off, either with the Paquelin cautery knife or with scissors, the edges of the cut mucous membrane being in the latter case united by sutures.

Stricture of the Urethra is much less common in women than in men. Normally, the female urethra is almost always large enough to admit a No. 14 catheter, and generally No. 17, but it may be congenitally small.

As in men, urethral stricture may be the result of gonorrhœal inflammation. It may be cicatricial, following injury received in labour, or result from syphilitic ulceration. There is a form of stricture met with in old women, in which there is fibrous thickening of the whole length of the canal. As the urethrovaginal septum is the homologue of the prostate gland in the male, the writer has suggested that these cases are analogous to enlargement of the prostate in the male. There are also cases of stricture due to the fibrous overgrowths which accompany the disease known as lupus

of the vulva (*esthioméne*) (*q.v.*). These growths sometimes surround the meatus and make the channel so small that it is difficult to get in even a fine probe. Cancer occurring in the anterior wall of the vagina leads to great narrowing of the urethra. Lastly, there are rare cases of passing retention of urine following cold, drink, and debauchery, and believed to be due to spasmodic stricture, such as occurs in the male. It is very rare for stricture of the female urethra to lead to the serious diseases of the bladder, ureters and kidneys that are such common results of stricture in the male, for the reason that the treatment of stricture in the female is so simple and so successful. But these secondary morbid changes do sometimes occur.

The *symptoms* are simply irritability of bladder, with often tenesmus and pain in micturition, and occasionally retention of urine.

The *diagnosis* is readily made by the obstruction encountered by the catheter.

The *treatment* of stricture in the female is rapid dilatation by the passage of bougies of gradually increasing size. This treatment is almost invariable successful, except in cancer, in which the best course is to open the bladder from the vagina with the knife, and so establish a vesico-vaginal fistula. This will relieve the patient from the intolerable tenesmus. In spasmodic stricture the passage of a catheter is all that is required.

Urethritis (*Inflammation of the Urethral Mucous Membrane*) is very common, arising by extension of inflammation from the vagina. It is usual in gonorrhœa, and in vaginitis from other causes. Some reflex congestion of the bladder and urethra occurs in most pelvic inflammations, and causes the vesical irritability and scalding in micturition which are usual symptoms in these conditions. This slight superficial urethritis seldom requires special treatment apart from the accompanying inflammation elsewhere, to which it is due.

Congestion of the Urethra and of the cellular tissue around it is most often seen during pregnancy. The urethra is swollen, thickened and tender; it may feel like a cord as thick as the thumb, or even larger. The symptoms are pain and frequency in micturition, and dyspareunia. The cause of these symptoms will be ascertained by vaginal examination, when the tender swollen urethra will be felt. The treatment consists in recumbency, laxatives, warm hip baths, and

vaginal douches, and avoidance of alcohol. If not treated this form of disease is apt to be very chronic, and may go on to the formation of an *abscess* in the urethro-vaginal septum. In that case the swelling becomes larger, harder, rounder, and more tender, and the symptoms more troublesome. The condition may remain apparently stationary for many months, but at length the abscess bursts, and the patient is relieved.

Treatment.—If there be doubt about the nature of the swelling the urethra should be dilated and the abscess opened, either on the urethral or the vaginal aspect, according to the side on which the tissue limiting the pus seems thinner.

Dermoid Cysts sometimes occur in the urethro-vaginal septum. Cysts are also met with which do not show evidence of a dermoid character. Such cysts, dermoid and others, sometimes suppurate and discharge into the urethra. A suppurating cyst will be distinguished from an abscess by its internal surface being smooth, not irregular and granular like the cavity of an abscess, and later on by its course, for it does not heal but continues to discharge.

The *treatment* is to excise from the vagina as much of the cyst wall as forms a diverticulum from the urethra, and then bring together with sutures the raw surfaces left by the incision.

Urethral Caruncle is a small, bright red growth from the posterior part of the meatus urinarius. These growths vary from the size of a hempseed to that of a filbert. When large they look something like a cock's comb. They consist of connective tissue, which may be found to have undergone at places myxomatous degeneration, are very vascular, are usually covered with pavement, sometimes with columnar epithelium; they may contain many glandular follicles, and are very rich in nerves.

Symptoms.—These depend upon the extreme sensitiveness of the growths. They consist of severe pain during micturition, during sexual intercourse, or whenever the part is touched. If the growth be large, walking therefore becomes painful. They readily bleed, and hæmorrhage on contact is a frequent symptom.

The *diagnosis* is easily made by inspection. The growth is quite superficial, springing from the mucous membrane, and not invading deeper parts; this distinguishes it from cancer.

Ætiology.—Nothing is known of this. They are hardly ever seen in children;

but may occur at any age after puberty. It has been asserted that they are of gonorrhœal origin; but they are often found without any evidence of past or present gonorrhœa. They occur in virgins as well as in those who have borne children.

The *treatment* is to cut away the growth and destroy its base. This is most easily done by putting the patient in the lithotomy position, protecting the adjacent mucous membrane with a piece of wet lint, guarding the rest of the urethra by a wooden staff passed into it, and then cutting through the base of the growth on to the staff with the red-hot knife of the Paquelin cautery. These growths are apt to return, even after what appears to be thorough removal.

A condition resembling caruncle, viz., *bright red patches*, exceedingly tender, is sometimes seen along the course of the urethra. Attention is called to this condition by the pain which the patient suffers in micturition, and the great sensitiveness which is manifested when the catheter is passed. If then the interior of the urethra be examined with a speculum (of which French's is the best), these red patches will be seen. Their nature has not yet been ascertained.

The *treatment* which is generally successful is the application of iodoform. This may be blown in by means of a quill, or applied in the form of an iodoform bougie.

Very similar symptoms are produced by the presence of *congestion and ulceration* around the vesico-urethral opening. These changes have been seen by the endoscope. They are cured by *treatment* such as is effective in cystitis—viz., urethral dilatation, or the making of a temporary artificial vesico-vaginal fistula.

Varicose Veins in the wall of the urethra are occasionally seen in women who have had many children. They usually accompany varicose veins of greater size in adjoining parts. Such varicose veins and urethral caruncles have alike had the term "urethral hæmorrhoid" applied to them. But the purplish red swellings which varicose veins form, do not present the extreme tenderness characteristic of caruncles. They scarcely ever require special treatment.

New Growths are occasionally met with in the urethra, but are comparatively unimportant, because they are so rare. *Mucous and fibrous polypi* have been observed. They can be removed by twisting them off, if small and near the

meatus; but if large and near the neck of the bladder, their removal should be accompanied by opening the bladder from the vagina. *Sarcoma* of the urethra has been once observed. The urethral orifice may be affected in common with other parts of the vulva by various diseases which are described elsewhere, such as syphilitic condylomata, ulceration, &c., follicular inflammation, lupus of the vulva (*esthioméne*). The urethra may be invaded by cancerous or tubercular disease; but these diseases very seldom primarily affect it.

Neuroses of the urethra have been described, but this is generally a convenient term for a case which has been incompletely investigated, and in which consequently therefore the real disease has not been diagnosed.

BLADDER.—Cystitis (*Inflammation of the Bladder*).—Cystitis in women differs from that disease in men as to its causation. It is most common as a result of retention of urine due to retroversion of the gravid uterus; or following labour, or after operations on the uterus or its appendages, but is rare as a result of urethral stricture. In connection with pregnancy and labour cystitis of great severity is sometimes seen. It may go on to sloughing and exfoliation of the whole vesical mucous membrane; or it may produce gangrene of the vesical wall at one spot, having as its result perforation of the bladder.

The *symptoms* are the same in both sexes. Exfoliation of the vesical mucous membrane should be suspected when, in a case of severe cystitis, the urine containing much deposit, we find the bladder apparently full, and on passing a catheter urine flows out, but suddenly stops before the bladder is emptied, and the point of the catheter feels as if it pressed against a solid substance within the bladder. When this is suspected, the best treatment is to cut into the bladder from the vagina.

The *treatment* of cystitis in the female is easier and more surely successful than in the male, because it is so easy to explore the bladder and remove foreign bodies by a vaginal incision. Exploration may be effected by dilating the urethra until it is sufficiently large to admit a small finger; if carried further, much risk of permanent incontinence of urine is entailed. To extract a stone, a growth, or a foreign body, an incision should be made in the middle line from the vagina. This can be closed with sutures, when what is

required has been done. Even if not closed, it will often heal. In cystitis that has resisted all other treatment, and especially in painful cystitis (supposed to be due to ulceration of the neck of the bladder) a cure may be effected by maintaining the vesico-vaginal opening patent for two or three months. It can then be closed by an easy operation, and usually the urine will then be found clear, and the function of the bladder free from pain.

G. E. HERMAN.

URINE.—EXAMINATION OF.

—The total amount of urine passed in twenty-four hours should be collected and measured.

COLOUR.—The healthy urine has a yellowish colour, which may vary in depth of tint at different times, according to the varying physiological states of the body. The depth of tint is diminished when the watery element is in excess. Thus the urine is limpid after profuse potations, after hysterical or other nervous attacks, in cases of simple anæmia, in both the forms of diabetes, and in granular kidney. The colour of the urine is increased in intensity when from any cause, such as excessive sweating, the urine is concentrated, also when pyrexia is present, and in certain wasting diseases, and in some cases of so-called pernicious anæmia. In the pathological states mentioned it is probable that the increased depth of colour is not due merely to a greater proportion of colouring matter being present, but also to the presence of a pathological pigment produced by the profound changes in the physiological processes. The normal colouring matter, urobilin, may be replaced, as Dr. McMunn has shown, by febrile urobilin, or by urohæmatoporphyrin, substances which are to be distinguished from the normal pigment by the spectra they exhibit on treatment with various re-agents, a matter which cannot be entered into here.

The pathological admixture with the urine, of certain normal fluids of the body, will alter its colour in a characteristic manner.

Bile is present in the urine in cases of jaundice and causes the urine to assume a brownish hue, which may in extreme cases appear almost black. On standing exposed to the air for some days such an urine occasionally becomes of a green colour.

Tests for Biliary Pigments.—Two reactions serve to detect the biliary

colouring matter in the urine and thus distinguish the brown colour due to the presence of bile, from that produced by other pigments.

Gmelin's Test is applied by placing side by side on a white porcelain slab a drop of the urine and a drop of strong nitric acid and allowing the two to come into contact, or by floating a layer of the urine on the surface of a little nitric acid in a test tube. At the point of contact of the two fluids a play of colours, green, violet, red, and yellow, will indicate the presence of bile. But the play of colours is not easily distinguished from the red colour which other matters in the urine give with nitric acid, and therefore the following test is to be preferred.

Maréchal's Test.—A test tube is filled to about one-third its depth with water and to this are added a few drops of tincture of iodine, so as to form a light brown liquid. This is then mixed with a little of the urine, when if bile be present a bright green colour is almost immediately developed. If the urine be very dark it is desirable to dilute it before applying the test.

Urobilin Icterus.—Gerhardt has drawn attention to a condition which he calls urobilin icterus. The skin and conjunctiva are coloured yellow, the urine is dark brown in colour, and it may be supposed that slight jaundice exists. Yet, when the tests for bile pigment are applied to the urine, none is found. The pigment which is present is an excess of urobilin, a normal constituent of the urine, and such excess is produced in the body by oxidation of bile-pigments. Gerhardt has applied to such urines the following test:—To a chloroform extract of the urine tincture of iodine and caustic potash are added, when a green fluorescence appears.

Tests for Biliary Acids.—The biliary acids are detected by *Pettenkofer's Test*, though this is not easily applied to urine. A little cane-sugar should be dissolved in the urine, and this poured gently on to the surface of sulphuric acid in a test tube. A purple colour at the junction of the two fluids indicates the presence of biliary acids.

Urine containing much bile occasionally deposits crystals of bilirubin.

Blood, according to its degree of admixture, causes the urine to assume either a smoky tint or a bright red colour, not easily confounded with any other condition. The blood-colouring matter alone may occur in the urine as

in hæmoglobinuria. In ordinary hæmaturia, blood corpuscles will be also found by microscopic examination. Hæmatoidin crystals are sometimes found as a urinary deposit.

Tests.—The blood-colouring matter is detected by its reaction with *Tincture of Guaiacum and Ozonic Ether*. A little of the urine to be tested is placed in a tube, and with it about two drops of tincture of guaiacum; then ozonic ether is added, and the whole well shaken, when, if blood-colouring matter be present, a bright blue colour is developed. Should this not appear at once, the test tube should be allowed to stand for a short time until the ether rises to the surface of the mixture. Such blue colour as has been produced will be absorbed by the ether, and will then be more easily seen. Should the urine contain iodide of potassium, as will happen when the patient is taking that drug, or saliva, a similar reaction will be shown, even though no blood be present.

Heller's Test.—If urine be boiled with liquor potassæ the phosphates contained in it are precipitated as a grey flocculent mass, but, if blood be present, the precipitate is coloured red or brown.

Chyle makes its appearance in the urine when there is leakage from the lymphatic vessels into the urinary passages. The urine is then of a milky colour, and is sometimes spontaneously coagulable. Under the microscope, granules and occasionally fat globules are seen; while the clot, if such has formed, will be seen to consist of threads of fibrin.

Pus causes the urine to be of a milky colour, but the greater part of the pus separates on standing, and its detection is easy with the aid of the microscope (see PYURIA).

Effects of certain Drugs upon the Colour of the Urine.—The administration of certain drugs causes the urine to assume characteristic colours. Carbolic acid and salol, which contains it, cause the urine to become black. It may happen that the black colour, which is due to oxidation products of hydrochinon, does not develop until the urine has been allowed to stand for a little time in contact with the air, and it rarely develops to a marked extent if the urine be highly acid in reaction. Resorcin, hydrochinon, pyrocatechin, tannic and gallic acids and tar, used externally or internally, may cause the same appearance. It occasionally happens that without any drug having been used, the urine

becomes of a black tint. Occasionally, as in one case observed by the writer, this is due to the presence of protocatechuic acid, and Dr. Kirk has also found in such urines a new body, which he has named uroleucic acid. When malignant tumours of a melanotic nature are present in any part of the body, but especially when they affect the skin, the urine may be dark in colour, and may deposit a black pigment. Here, again, the pigment only appears when the urine has stood for some time in contact with the air, or when the urine has been treated with an oxidizing agent such as hydrochloric acid and chlorate of potash or liquor ferri perchloridi. The dark pigment may also be demonstrated by the addition of bromine water, which gives a precipitate, at first yellow, afterwards black.

Rhubarb or chrysophanic acid produces a dark yellow colour of the urine, changing to red if ammonia be added. Senna causes a similar colour to appear. Santonin, when given internally, often causes the patient to pass a urine which is bright yellow if the urine be acid, orange red if it be alkaline. When logwood is administered internally hæmatoxylin is excreted in the urine, and gives a violet colour if the urine be alkaline or if ammonia be added. Large doses of quinine cause the urine to become dark in colour, kairin produces a brown, thallin a green, and antipyrin a deep red colour of the urine. Antifebrin is stated to produce no change in the urine, but in two cases which came under the notice of the writer this drug caused the urine to assume a deep red tint, due to the presence of hæmatoporphyrin, which was separated from the urine and examined by the spectroscope.

Indicanuria.—An alkaline urine after standing in contact with the air for some time may be covered by a blue scum. A few cases have been recorded where the blue colour had developed within the body and was seen in the urine as soon as it was voided, in the form of a general diffused blue tint and bluish particles. The colouring matter is indigo-blue derived by oxidation from indican which is a normal constituent of the urine. Indol, a product of pancreatic digestion is absorbed from the intestines and becomes changed in the body into indican, which is excreted in the urine as an ether-sulphuric acid.

Tests for Indican.—The urine is mixed with an equal quantity of strong hydrochloric acid, when a reddish-violet

colour is formed, caused by the production of indigo-red. If now a weak solution of bleaching powder be added drop by drop, the violet changes to a blue colour (indigo blue) which is quite bleached by excess of the chloride of lime. The blue colour may be extracted by shaking with ether, and the depth of colour in the ethereal extract shows roughly the amount of indican present in the urine. Indican is excreted in greater amounts when putrefactive processes are going on actively in the intestine, consequently greater quantities are found in cases of peritonitis and of obstruction of the small intestine. Other products of the decomposition of proteids, amongst which the most important are skatol and kresol, are absorbed from the intestine together with the indol, and are similarly excreted in the urine as ether-sulphuric acids. These bodies cause a deep red colour to develop in the urine when strong nitric acid is added and consequently interfere somewhat with the nitric-acid test for albumen and bile.

ODOUR.—Normal urine has a peculiar odour, which can only be styled urinous. When the urine is heated with a mineral acid the odour is intensified. Urine containing a fixed alkali has a sweetish smell like that of the urine of a horse. Ammoniacal decomposition of the urine can be detected by the sense of smell, since the presence of ammonia and also of sulphuretted hydrogen is at once perceived. A few cases have been recorded in which sulphuretted hydrogen gas was present in the urine before any decomposition had set in, indeed as soon as the urine was voided. In many cases of diabetes the urine has an odour resembling that of chloroform. The urine of a person who has imbibed turpentine in any way, either medicinally, or, for instance, by sleeping in a newly painted room, smells of violets. Asparagus imparts a very disagreeable and intense odour to the urine. Copaiba and cubebs similarly impart a peculiar smell to the urine.

SPECIFIC GRAVITY.—The specific gravity of the urine is determined by the urinometer, the form of which is well-known. In using it, it is necessary to make sure that the test-glass is sufficiently wide to allow of a moderate quantity of urine remaining between the sides of the glass and the urinometer, and also that sufficient urine is present to float the urinometer free from the bottom of the glass. If there is not sufficient urine obtainable for this purpose, two courses

are available, either the urine may be diluted with an equal quantity of distilled water, and when the specific gravity of the mixture is obtained by the urinometer, the decimal points be doubled; or beads of different degrees of gravity, which are sold for the purpose, may be used, the bead which will float in the urine determining the specific gravity of the fluid. For more accurate determinations it is well to weigh a known quantity of the urine and compare it with that of the same quantity of distilled water.

The specific gravity of the urine is expressed in its proportion to that of water taken as 1, the comparison being made to the third decimal place, or more frequently, for convenience, the specific gravity of water is taken as 1000.

The specific gravity of urine is a measure of the amount of solid matter dissolved in it. If the two last figures of the specific gravity be multiplied by 2 (Trapp), or, more accurately by 2.33 (Haeser) the amount of solid matter per 1000 parts of urine is approximately obtained.

The urine in health has a specific gravity ranging between 1015 and 1025. Abundant potations on an empty stomach will lower the specific gravity to a figure very nearly that of distilled water. In disease, the lowest specific gravities are met with in hysteria, diabetes insipidus, and albuminuria. In regard to the latter affection it must, however, be remembered that it is not the presence of albuminuria which produces the low specific gravity. Gouty urine, for instance, may contain albumen and yet be of high gravity. In the majority of cases, nevertheless, albuminuria is the result of some disease of the kidneys which diminishes the secretion of solids, and is accompanied by high arterial tension which increases the amount of water. The disease, *par excellence*, which increases the specific gravity of the urine, is diabetes mellitus. On the other hand, the writer has met with sugar in an urine having a specific gravity of only 1013.

REACTION.—The reaction of the urine is ascertained by dipping into it a strip of litmus paper coloured red or blue. If alkaline, the red paper becomes of a blue colour, if acid, the blue paper becomes red. For practical purposes it is well to use litmus paper, coloured purple, since this is tinted red by an acid, and blue by an alkaline fluid. The normal urine, as usually examined, is of an acid reaction, by reason, mainly, of

the presence in it of acid salts. Yet if passed at frequent intervals, it is found that the urine varies in its reaction at different times of the day. Food has a marked effect upon the reaction of the urine. Shortly after a meal, the urine begins gradually to lose its acid reaction, and may actually become alkaline. After a time, the reaction gradually returns to its acid character, indeed, the meal, finally, to a certain extent, increases the acidity of the urine. This phenomenon of the "alkaline tide" has been variously explained. According to Dr. Bence Jones it is due to the withdrawal of acid gastric juices from the blood, for the purpose of digestion, while Sir William Roberts has suggested that it is produced by the accession to the blood of the alkaline bases contained in the food. The matter, however, is not so simple as would appear from what has been said above. Thus the urine of the forenoon is specially prone to be alkaline. The writer observed this when, after fasting for many hours, he took as his sole meal the raw whites of a dozen eggs diluted with water. Again, at other times of the day and without any relation to food, the urine may lose its acid reaction. The reasons for these phenomena are not yet known.

It is important to notice, when the urine is alkaline, whether the alkalinity is due to fixed or volatile alkali. The volatile alkali is ammonia, and, if present in considerable quantity, its vapour alone will cause a moistened litmus paper to turn blue, when the latter is held close over the urine. The question is conveniently determined by dipping a red litmus paper into the urine and then allowing it to dry slowly in the air. If the blue colour has been produced by fixed alkali it will remain after the paper has dried; if by ammonia, it will disappear when the alkali has evaporated.

The urine is easily rendered alkaline by drugs, especially by the carbonates of the alkalies, or by the alkaline salts of the vegetable acids, which appear in the urine as carbonates. It is important to bear this in mind when testing for albumen by boiling, since the albumen will be changed into alkali albumen and is then not coagulable by heat. The urine is also liable to become alkaline from fixed alkali in many diseases, especially in those of a debilitating character; alkalinity from ammonia is in almost every instance the result of putrefactive changes in the urine, an effect of the action of micro-organisms, which change

the urea of the urine into carbonate of ammonia. The chief of these organisms is the micrococcus ureæ first described by Pasteur.

The acidity of the urine can be also increased by drugs, but only to a limited extent. The most efficacious drug for this purpose is the benzoate of ammonia, which is excreted in the urine as hippuric acid.

Estimation of the Degree of Acidity.

—The acidity of the urine can be estimated by neutralizing it with a solution of caustic soda of known strength. The strength of this solution is determined by a standard solution of oxalic acid, and is conveniently such that 1 cubic centimetre neutralizes 0.063 gramme of oxalic acid. A burette is filled with the soda solution, best diluted to $\frac{1}{10}$ or $\frac{1}{5}$, and the solution is then gradually added to the urine until complete neutralisation is attained. From the number of cubic centimetres of the alkali solution used, the acidity of the urine, reckoned in milligrammes of oxalic acid, can be easily calculated. The attainment of the neutralization is ascertained by the reaction of the urine on litmus or rosolic acid.

DEPOSITS.—The normal urine is perfectly clear when it is first passed from the bladder, but is prone to become turbid, and to deposit a faint hazy cloud, consisting of mucus and epithelial cells, after it has stood for a little time, but before ammoniacal fermentation has set in. In diseased conditions, many other deposits are found in the urine, and they may be conveniently discussed under two heads, the inorganic and the organic.

In order to examine the deposit from urine, it should be allowed to stand in a conical glass, when the deposit will fall into the apex of the cone, and can then be examined by the microscope. The most useful glasses are those made by Mottershead & Co., of Exchange Street, Manchester, after a pattern furnished by Sir William Roberts.

Inorganic Deposits.—*Urates.*—The most common deposit from the urine is that composed of the amorphous urates. These fall from acid urines, and form a mass more or less dense, having no appearance of crystallization, which usually soon settles to the bottom of the glass. The amorphous urate deposit may be pale grey in colour, but most frequently it carries down with it some of the colouring matter of the urine, and thus assumes varied tints, which may, however, be classified as pink and red. The

surface of the urine which has deposited urates is commonly covered by a faint purplish bloom. Under the microscope the deposit is seen to consist of amorphous finely granular matter. The deposit re-dissolves on warming the urine, and also when alkalis or their carbonates are added. Acids, however, first increase the amount of the precipitate, and will even cause it to appear in a urine in which no deposit has previously occurred. In a little time acids decompose the deposit, and cause the appearance of crystals of uric acid.

The *Amorphous Urate* deposit is a quadrurate containing one atom of alkali and three of hydrogen, combined with two molecules of uric acid. Sir William Roberts has shown that it is very easily decomposed, and is, in fact, always decomposed after standing for a time in contact with the urine, being transformed into bi-urate and uric acid. The bi-urate is again changed into quadrurate, and again decomposed until, in this way, the whole of the uric acid of the urine, whether combined or uncombined, is at last thrown down. The decomposition is hindered by the presence of the salts and the pigments of the urine.

This deposit is produced by a low temperature, an acid re-action, and concentration of the urine. It is hence common in cold weather and after profuse sweating, without the presence of any pathological condition. Amongst the diseased states which are associated with it, the most important are digestive troubles and pyrexia. The dark-red coloured urate deposit is significant of very serious organic disease, commonly the presence of malignant tumours of the abdomen, while the pale pink urates are of little clinical importance.

Urate of Soda is sometimes deposited from the urine, and frequently before the urine has left the bladder. It occurs as "hedge-hog" crystals, globes with spiny projections. It forms a white or grey deposit in acid urines, and is associated especially with the gouty state and with the pyrexial attacks of children. The rough crystals are prone to cause severe vesical irritation.

Urate of Ammonia is sometimes found, together with a deposit of phosphates, in urine which has undergone ammoniacal decomposition. It occurs in the form of spheres and dumb-bells.

Uric Acid.—Uric acid is also a very common urinary deposit. The uric-acid deposit occurs in acid urines, and gene-

rally, but not invariably, in those of high density. It may, for instance, occur in the limpid urine of low specific gravity, which is passed in chronic Bright's disease. The deposit is almost always coloured red or brown, whence its common name of "urinary sand." It is even to the naked eye crystalline, and while it falls for the greater part to the bottom of the glass, some of the crystals arrange themselves in lines on the sides of the glass, others form a slight scum on the surface. Under the microscope the crystals are seen to assume the most varied forms, of which perhaps the most common are flat, elliptical plates. Cubes, prisms and rhomboids are also met with, and these may collect into groups so as to assume most fantastic forms. Even under the microscope the uric-acid crystals usually retain a little of the colour, which is evident in the microscopic deposit.

The uric acid deposit is soluble in alkalis, insoluble in acids, but is decomposed with effervescence by strong nitric acid. The *Murexide Test* is most delicate, and at once decides the nature of the deposit, if this is in doubt. A little of the deposit should be placed in a porcelain evaporating dish, and on it poured a drop or two of strong nitric acid. Gentle heat is now to be applied, preferably by means of a water bath, until the nitric acid is evaporated and an orange-yellow deposit remains. To this is now to be added a drop of liquor ammoniæ, when, if uric acid be present, a beautiful purple colour will be immediately developed. The quantitative estimation of uric acid will be discussed later in this article.

The deposit of uric acid from the urine relates rather to the reaction of the urine than to the absolute quantity of uric acid contained therein. A perfectly healthy urine will deposit uric-acid crystals if allowed to stand sufficiently long (*see* RENAL CALCULUS). Yet when the urine habitually deposits uric acid within a short time of its emission this is distinctly a pathological phenomenon.

Oxalate of Lime forms a white deposit, which falls to the bottom of the glass, and is limited above by a wavy, film-like layer. On the sides of the glass, too, it forms lines of crystals, in the same manner as does uric acid, but without the colour of the latter. Under the microscope the deposit is seen to be constituted by crystals, which have the forms of small octahedra, dumb-bells, or

ovoids. The deposit does not disappear when the urine is heated, and is insoluble in acetic acid, alcohol and ether, but soluble in the mineral acids. The conditions of its formation will be found in the article upon OXALURIA, to which the reader is referred.

Cystine.—This is one of the rare urinary deposits. The urine depositing it is generally turbid when first passed, showing the great tendency of such an urine to form calculi within the urinary passages. It is usually faintly acid, and is said to have sometimes a yellow colour and an oily appearance. The deposit, which settles on standing, is light grey in colour, and under the microscope its nature is readily recognised by the shape of the crystals composing it, hexagonal plates. Further, it can be recognised easily by its chemical reactions. It is soluble in ammonia, in solutions of carbonate of potassium or sodium, and in the mineral acids, but it is insoluble in a solution of carbonate of ammonium and in vegetable acids, water and alcohol. It is not dissolved by heat. From its solution in ammonia it crystallizes in the form of hexagonal plates and square prisms. When the deposit is heated to incandescence it gives off thick white fumes having an odour of garlic. The urine containing it decomposes very easily, and Dr. Golding Bird found that in doing so it changed colour from yellow to green.

The occurrence of cystine as a deposit in the urine is specially interesting, by reason of its liability to form urinary calculi. The tendency to excrete cystine may last for years without any deterioration of the general health, beyond that which the irritation of urinary calculi may cause. It is more common in the young and in males, and shows a decided tendency to run in families.

Cystine contains a large percentage of sulphur, and therefore it is assumed that the liver is the seat of its formation, but no more than this is known of its origin.

Xanthine has been found in very rare instances as a constituent of urinary calculi, and has been said to have constituted a urinary deposit. Its identity, however, was not perfectly proved. It is soluble when heated and dissolves without effervescence in strong nitric acid. When evaporated, a bright yellow deposit is left, which is changed to violet red on the addition of liquor potassæ (Stecker). Its crystals have the shape

of pointed ovals resembling those of uric acid.

Leucin and Tyrosin.—The urine of patients suffering from acute yellow atrophy of the liver contains both leucin and tyrosin. The latter is deposited in the form of bunches of acicular crystals. Leucin, however, usually remains in solution, but is occasionally thrown down in spherical crystals.

Phosphates.—Phosphates of lime, magnesia, and ammonia are very frequently deposited from the urine. As a rule, when these salts are precipitated the urine is alkaline, but two of them, the stellar and the triple phosphates, are occasionally thrown down from urines which are neutral or even faintly acid. Again, an urine which has deposited phosphates will usually give a further precipitate when heated, a reaction due, as Sir William Roberts has shown, to the fact that phosphate of lime is less soluble at high than at low temperatures.

Amorphous Phosphates have the chemical composition of $\text{Ca}_3(\text{PO}_4)_2$, and are invariably deposited when the urine becomes alkaline. They form a white, flocculent precipitate, which is not dissolved by heat, but disappears instantly when acetic acid is added to the urine. Under the microscope it consists of amorphous granules.

Stellar Phosphate has the composition $\text{CaHPO}_4 + 2\text{H}_2\text{O}$ and is of somewhat rarer occurrence. It forms a white deposit, composed of rod-like crystals, arranged in rosettes or stars, whence its name. Other forms, resembling Indian clubs, are also met with. From the observations of Sir William Roberts we know that the occurrence of this body as a deposit is usually a sign of some grave disease. Albeit, the same deposit may occur in the urine of a healthy person, if it be rich in lime and of low acidity.

Triple Phosphate has the composition $\text{MgNH}_4\text{PO}_4 + 6\text{H}_2\text{O}$, and usually occurs together with the amorphous phosphate in urine which has undergone ammoniacal decomposition. Under the microscope, the deposit is seen to be composed of large crystals, whose predominant form is a triangular prism with bevelled ends, and they are further characterized by their high refracting power.

Magnesium Phosphate, having the composition $\text{Mg}_3(\text{PO}_4)_2$, has been found in a strongly alkaline urine in the form of highly refractile rhomboid plates.

Carbonate of Lime.—This substance does not often form an urinary deposit in

man, but does occasionally compose a urinary calculus. It has been found as a rare deposit in sphere-like crystals.

Sulphate of Lime is sometimes found as a deposit, either as crystals which assume the form of long needles, plates, or prisms, or as dumb-bells.

Hippuric Acid is a rare urinary deposit, but may be found when a patient is taking benzoic acid or salicylic acid internally. It forms rhombic prisms resembling one of the varieties of uric acid crystals, but distinguished from these by not giving the murexide reaction.

Fat occurs in the urine of chronic Bright's disease and in chylous urine, as small, highly refracting globules.

Fatty Acids.—Von Jaksch has described a deposit which he believed to be composed of the lime and magnesia salts of the fatty acids. It consisted of crystals resembling those of tyrosin, but not giving the chemical re-actions of that body.

Cholesterine.—Plates of this substance are sometimes, but rarely, met with as an urinary deposit.

Indigo, as already mentioned, may form in decomposing urines. It may then occur as a deposit, as blue crystals, or amorphous masses.

Organic Deposits.—(1) *Tube-Casts* (see CASTS, URINARY).

(2) *Epithelium*.—In cases of nephritis the epithelial lining of the renal tube is liable to become separated from its attachments, and the individual cells find their way into the urine. They present themselves as a round nucleus, enclosed by a variable amount of granular protoplasm. The whole is irregular in form, but is more or less rounded. The nucleus may sometimes be divided, and the protoplasm also may show degenerative changes, amounting sometimes to atrophy of the cell.

Other epithelial cells which may find their way into the urine, are (a) those of the pelvis of the kidney, also of the ureter and bladder; these are irregular in form, many of them "tailed," and the dovetailing of the irregular epithelium characteristic of the mucous membrane of these parts is frequently obvious when patches of cells are discharged. The presence of such cells indicates inflammation of the mucous membrane. (b) Urethral cells; these are rounded flat epithelial plates, frequently found adhering in the form of a layer. (c) Vaginal epithelium—large flat scales. (d) Cells from the mucous membrane of the mouth;

these also are large flat scales, which are found in urine when the saliva has been mixed with it.

(3) *Pus*.—Urine containing pus is usually cloudy when passed from the bladder, and, on standing, deposits a greyish layer at the bottom of the glass. The supernatant urine invariably contains albumen. When the deposit is examined under the microscope it is seen to consist of leucocytes, and when treated with liquor potassæ it becomes thick and ropy. This condition of the pus is assumed spontaneously if the urine has undergone the ammoniacal decomposition. The leucocytes appear as small, round, granular bodies, which, when treated with dilute acetic acid, become clear and show a horseshoe-shaped or divided nucleus (see also PYURIA).

(4) *Blood Corpuscles*.—These appear in the urine, either in their usual form as bi-concave discs, or, more frequently, shrivelled, crenated, or swollen, from the action upon them of the water and salts of the urine. The chemical reactions of blood have already been described above.

(5) *Hæmoglobin*.—In cases of hæmoglobinuria dark brown granular masses of hæmoglobin are found as an urinary deposit.

(6) *Spermatozoa*.—These form a deposit in the urine resembling mucus, but its nature is at once evident on microscopic examination, when the characteristic filaments are seen.

(7) *Mucus*.—Mucus forms a white glairy sediment in the urine, which may be mistaken for pus. Under the microscope, however, it shows merely amorphous granules, threads, or flakes, and is soluble in liquor potassæ.

(8) *Fungi*.—Many forms of the lower vegetables may be found in the urine. Amongst these may be mentioned varieties of torulæ, which grow in acid urine and will be recognized by their spores and thallus, sarcinæ, distinguished by their characteristic dice-like shape, and bacteria of different kinds. In by far the majority of cases these plants are extraneous additions to the urine after it has been voided, and are associated with its decomposition. This is not always the case. A few instances have been recorded in which organisms, either micrococci or bacilli, were present in the urine as soon as it was passed, and the condition has been named idiopathic bacteruria. Pathogenic germs, too, may be found in the urine. Of these, the more important are tubercle and typhoid bacilli and the micrococci of

erysipelas and pyæmia. Most of these germs can easily be detected by staining them with methylene blue and examining with an oil immersion lens and an Abbé's condenser. For the tubercle bacillus a special method is required. A little of the pus or cheesy matter, which is always present in such cases as give rise to a suspicion of the presence of tubercle in the urinary tract, is to be spread upon a cover-slip and allowed to dry in the air. It is advisable, when examining for tubercle bacilli in the urine, to take a somewhat thick layer of pus, not a thin layer, as is the custom in examining sputum. After drying, the cover-slip is drawn through a flame three times in order to fix the albumen. Then the slip is to be floated on a small quantity of Ziehl's fuchsin solution, consisting of 100 parts of water, 5 parts of carbolic acid, 10 parts of alcohol, and 1 part of fuchsin. The solution is to be gently warmed and the cover-glass allowed to remain floating on it for a quarter of an hour. Then it is washed in a 25 per cent. solution of nitric acid for a few moments until most of the colour seems to have disappeared. It is further washed in water, and stained again by being floated for five minutes on the surface of a saturated watery solution of methylene blue. Again it is washed in water, dried and mounted in Canada balsam, when the tubercle bacilli will be seen as red rods on a blue ground.

(9) *Animal Parasites*.—The embryos of the filaria sanguinis, hydatid hooklets and cysts, the eggs of bilharzia hæmatobia, rhabditis genitalis, and ascarides are occasionally found in the urine.

(10) *Portions of Neoplasms*.—Tumours which ulcerate into the urinary passages will discharge portions of their tissue into the urine. Nevertheless, tumours of the kidney cannot be diagnosed by examination of the urine. The separated cells of a tumour cannot be distinguished from those of the urinary passages. Where, however, not merely separated cells, but actual portions of a tumour, are discharged into the urine, as happens, for instance, in the case of villous tumours of the bladder, important aid to diagnosis is afforded by their recognition.

(11) *Foreign Bodies*.—Lastly, an observer must be prepared for the presence in the urine of various foreign matters, such as hair, the fibres of flax, cotton and silk, wool, feathers, portions of vegetable matter, and muscle fibre.

DISSOLVED MATTERS.—Space will not

allow of more than a sketch being given here of the methods employed in detecting and estimating the various substances which may be in solution in the urine. For fuller details, works on urinary analysis must be consulted.

(1) **Albumen** (*see* ALBUMINURIA).

(2) **Sugar** (*see* GLYCOSURIA).

(3) **Urea**.—The amount of urea daily excreted in the urine is a measure of the nitrogenous waste of the economy, and is therefore of considerable clinical interest. The average amount excreted by a healthy man in twenty-four hours is about 500 grains or 32 grammes. It is diminished during exercise, increased in the period of rest which follows exercise. It is increased also by nitrogenous food. Generally speaking, it is increased during pyrexia, diminished during convalescence from pyrexia. In organic diseases of the kidneys it is markedly diminished, while in both diabetes mellitus and diabetes insipidus, the daily excretion is increased in amount.

Quantitative Estimation of Urea.—It is important in estimating the amount of urea in a specimen of urine to perform the analysis before any decomposition has set in, since the urea is readily decomposed, as already stated, into carbonate of ammonia.

The Hypobromite Method.—This is the most ready means of estimating urea for clinical needs. Several kinds of apparatus for this purpose are in use, of which the writer has found Dupré's to be the most convenient. The principle of the method is that urea is decomposed by hypobromite of soda, and its nitrogen is discharged as free gas, which can then be measured in a graduated tube. Dupré's apparatus consists of a small flask closed with a caoutchouc stopper, in which the hypobromite solution is placed, and from this an india-rubber tube leads to a long graduated tube, the mouth of which is under water in a large wide jar. Since solution of sodium hypobromite is quickly decomposed on standing, it is well to make it fresh for each estimation, by adding 5 c.c. of bromine to 45 c.c. of a 40 per cent. solution of caustic soda. Of this solution 25 c.c. are placed in the small flask, and 5 c.c. of urine are poured into a narrow tube, which is then placed in the flask in such a manner that none of the urine is mixed with the hypobromite solution until the flask is inclined. The stopper being now replaced, the graduated tube is lowered until the water in it reaches the zero mark, and by means

of the opening at the top of the graduated tube the pressure inside and outside of it are equalized. The small flask is now tilted, and the urine allowed to gradually mix with the hypobromite solution, the mixture being finally shaken to ensure due discharge of the nitrogen. After waiting ten minutes, the amount of nitrogen collected in the graduated tube is read off, care being taken that the water inside and outside the tube are at the same level. The graduated tube may be marked merely in divisions of cubic centimetres, when the quantity of urea in the five cubic centimetres of urine taken can be calculated from the fact that 37.3 c.c. of nitrogen correspond to 0.1 gramme of urea; or the tube may be graduated in percentages of urea. Uric acid, creatin and other nitrogenous bodies of the urine, also give off nitrogen by this manipulation, while urea only gives off 92 per cent. of its nitrogen. Thus about 4.5 per cent. must be subtracted from the total amount of nitrogen produced, to obtain the exact amount discharged by the urea of the urine.

Liebig's Method.—This is also in use, and depends upon the fact that urea is precipitated by a solution of mercurous nitrate. The phosphates and sulphates of the urine are first removed by baryta solution. Then a solution of the mercurous nitrate is added until all the urea is precipitated, which is known by the urine at this point giving a yellow colour with a solution of carbonate of soda. But a certain amount of the mercurous nitrate solution has to be added before precipitation of the urea commences. This amount must be noted and subtracted from the total quantity of solution used, since it is the amount necessary to change the chlorides of the urine into bichloride of mercury, and until this is done no urea will be thrown down. From the quantity of mercurous nitrate solution used, the amount of urea in the quantity of urine taken can be calculated. It is convenient that the mercurous nitrate solution should be of such a strength that 1 cubic centimetre corresponds to 10 milligrammes of urea. For greater accuracy it is desirable to first estimate the chlorides present by a solution of nitrate of silver. Further details cannot be given here.

(4) **Uric Acid.**—The murexide test for the detection of uric acid has already been given. For an estimation of its quantity either gravimetric or volumetric methods may be made use of. Employing the gravimetric method 5 c.c. of hydro-

chloric acid are added to 100 c.c. of filtered urine, and the mixture allowed to stand for twenty-four hours, when the uric acid will have separated out and can be weighed. Of the volumetric methods that of Haycraft is most employed. It is based on the fact that nitrate of silver forms a urate of silver, when brought into contact with uric acid, and the silver contained in the latter salt can be estimated by titration. Details of the method will be found in the *British Medical Journal*, December 1885.

(5) **Sulphates.**—These occur in the urine as simple sulphates and as salts of the ether-sulphuric acids. The simple sulphates are precipitated by the addition of a solution of barium chloride to the urine slightly acidified with acetic acid, the compound sulphate, not until the urine has been boiled with hydrochloric acid. The method for estimating these two forms of sulphates will be found in Von Jaksch's "Clinical Diagnosis," Dr. Cagney's translation, p. 245.

(6) **Phosphates.**—Phosphates are estimated in the urine by the uranium process. The solutions required are: (1) Uranium acetate solution having such a strength that 1 c.c. corresponds to 5 milligrammes of phosphoric acid. (2) A saturated solution of ferrocyanide of potassium. (3) A solution of sodium acetate containing 100 grammes in the litre together with 100 c.c. of acetic acid. The strength of the uranium solution is determined by a standard solution of sodium phosphate.

Fifty c.c. of the urine are mixed with 5 c.c. of the acetate solution and heated to near the boiling point. The uranium solution is then run in until the mixture gives a brown colour with a drop or two of the ferrocyanide solution, when the wished-for point of the total precipitation of the phosphates is reached. The quantity of uranium solution then gives the amount of phosphoric acid in the quantity of urine employed.

(7) **Chlorides.**—The chlorides of the urine are precipitated by nitrate of silver in the presence of nitric acid. This can be used as a rough test of their presence or absence by adding only a drop of a nitrate-of-silver solution. The chlorides are estimated by means of a solution of nitrate of silver of such a strength that 1 c.c. corresponds to 10 mgr. of sodium chloride. For details of the process, Sutton's "Volumetric Analysis" may be consulted.

(8) **Acetone.**—Acetone has been found in the urine in a great variety of condi-

tions, of which the most important is diabetes. It has also been found in the urine of patients suffering from fever, inanition, and cerebral disorders. Further, a certain amount of acetone can be detected in healthy urine. For its detection the urine should be distilled, and one of two tests applied to the distillate. These are:

(1) *Lieber's Test*.—A few drops of a mixture containing caustic potash, iodine and iodide of potassium are added to a small quantity of the distillate, when, if acetone be present, a precipitate of crystalline iodoform is produced. (2) *Legal's Test*.—To the distillate are added a few drops of a concentrated solution of sodium nitroprusside and also a little solution of caustic potash. A red colour is produced which rapidly disappears, and if acetone be present, gives place, on the addition of acetic acid, to a purple colour.

(9) *Diacetic Acid*.—The urine of diabetics often gives, with a solution of perchloride of iron, a burgundy-red colour, which was believed to indicate the presence of diacetic acid. Certain precautions, however, must be taken before this test can be accepted. In the first place, the presence of acetone must be ascertained as above, since its reactions always occur when diacetic acid is found. Then a strong solution of perchloride of iron is added to the urine; any phosphates which are precipitated are filtered off and more iron solution is added. When the red colour appears, a portion of the mixture is boiled, and, if due to diacetic acid, the colour should still remain. To another portion of urine is to be added sulphuric acid and ether. The ethereal extract should give the perchloride reaction after standing twenty-four to forty-eight hours (Von Jaksch).

For Ehrlich's diazo reaction, see TYPHOID FEVER, p. 871.

ROBERT MAGUIRE.

URINE, RETENTION OF, IN THE FEMALE.—Retention of urine may arise from the following conditions:—

(1) Retroversion of the gravid uterus, which is mentioned first as being the most common cause of retention sufficiently prolonged to lead to serious ill consequences (see PREGNANCY, DISEASES OF).

(2) Retroversion of an uterus enlarged by a fibroid. This is much rarer, but may produce the same results as retroversion of a pregnant uterus.

(3) Impaction of a tumour, either uterine or ovarian, in the pelvis, causing pressure upon the urethra.

(4) Pressure upon the urethra by a pelvic abscess, hæmatocele, or an extra-uterine gestation cyst. The urethra may either be directly compressed on, or the uterus may be pushed forwards against it. The latter is the more common condition.

(5) Hysterical retention of urine. This is the commonest kind of retention in young unmarried girls of a neurotic type.

(6) Atony of the bladder from overdistension.

(7) Stricture of the urethra—rare in women.

(8) Congestion or abscess of the urethro-vaginal septum.

(9) Urethral caruncle: retention being *quasi* voluntary, due to the patient's shrinking from the pain of micturition.

(10) So-called "lupus" of the vulva: the fibrous overgrowths blocking the urethra.

(11) Cancer involving the urethro-vaginal septum.

(12) In the first few days after delivery retention is common, partly from swelling of the urethra from contusion during labour, partly from the laxity of the abdominal parietes, which renders the patient unable, in the recumbent position, to make the necessary expulsive effort.

(13) Spasmodic stricture of the urethra, from drink, exposure, sexual excess, &c., has been described, but is very rare.

(14) Reflex influences, as from hæmorrhoids, or fissure of the anus. Other causes, which occur equally in both sexes, do not need enumeration here.

The obvious *treatment* is to draw off the urine with a catheter. In hysterical retention this should be postponed as long as possible, and should be done by a nurse.

G. E. HERMAN.

URINE, SUPPRESSION OF.—

By suppression of urine is understood that condition in which no urine reaches the bladder, as opposed to retention of urine where the bladder is full but no urine passes from the urethra. Suppression of urine may arise from total abolition of the secreting power of the kidneys, due directly to some disorder of the organs themselves, or on the other hand, from some obstruction in the pelvis or ureter of both kidneys, which, while at first causing retention of urine in the pelvis and calyces, afterwards produces abolition of secretion. The first of these conditions is known as non-obstructive, the second as obstructive, suppression of urine. The symptoms

of the two conditions are different and will require separate description.

I. Non-obstructive Suppression.—This is prone to arise in the course of the specific fevers and especially in the algid stage of Asiatic cholera. Organic disease of the kidneys of any kind may be the cause of little or no urine being secreted, and this is specially seen in cases of acute nephritis, and in the later stages of chronic Bright's disease. It must be remembered too that a dose of opium may cause almost absolute suppression of urine if the kidneys are in a damaged state. Mere exposure to cold and shock of all kinds, but especially that following major operations, act similarly. Operations on the urethra are specially liable, if the kidneys are diseased, to produce suppression of urine, preceded by rigors and pyrexia. Hysterical patients occasionally suffer not merely from retention, but also from true suppression of urine, which may last for days and yet ultimately be followed by recovery.

The *symptoms* of non-obstructive suppression are those of ordinary uræmia (see URÆMIA). Vomiting, dyspnoea, delirium, and convulsions usher in the attack, and the patient usually dies comatose, if the condition be unrelieved. Those cases due to hysteria are, however, characterized by almost entire absence of these distressing symptoms. Such patients suffer from vomiting, and the vomit may contain a certain amount of urea, but for days, until the renal secretion is again established, the patient may remain in an apparently comfortable condition.

The actual *pathology* of non-obstructive suppression is still obscure. The kidney itself has in such cases been found congested. Probably the suppression is brought about through the agency of the nervous system, and in those cases which arise from catheterization presumably the irritation of the urethra exerts a reflex effect upon the sympathetic nerves of the kidney, and thereby abolishes secretion.

Treatment.—The treatment adopted for other forms of uræmia should be made use of here. Hot baths, and especially the blanket bath, are most efficacious. The patient should be encouraged to drink copiously of barley water and other diluents. Perspiration may be induced by subcutaneous injection of pilocarpin, when internal medication is prohibited by the vomiting.

II. Obstructive Suppression.—The most common cause of obstructive sup-

pression is blocking of the ureter, generally at its entrance into the bladder, by a small calculus formed in the pelvis of the kidney, the opposite kidney having been destroyed at some previous time by this or some other cause, or being congenitally absent. Again, both ureters may be involved in the growth of carcinoma or tubercle of the bladder. Congenital malformations, of the renal arteries or of the ureters are among the rarer causes of obstructive suppression.

Symptoms.—In most cases the exciting cause of the suppression acts suddenly. After an attack of renal colic, the painful symptoms gradually subside, but no stone is passed, and the excretion of urine is abolished. Yet other symptoms do not appear rapidly. The patient feels fairly comfortable even for a few days, and it is difficult to persuade either him or his friends of the serious nature of his condition. Yet he is not free from symptoms which are suggestive to the observer. Great weakness and twitching of the muscles gradually develop. The patient becomes restless, and although he is at times drowsy yet he gets little or no real sleep. The urine may be entirely suppressed, but more frequently small quantities are passed at irregular intervals. Such urine is limpid and of low specific gravity, containing sometimes a little albumen. The respirations are panting. The pupils, normal at first, become contracted. Very rarely is there any gastric disturbance or diarrhoea; still more rarely, dropsy of any part of the body. There is no odour of ammonia perceptible in the breath. The drowsiness increases, and with it the muscular weakness, yet the mind is normally active when the patient is roused, until near the end of the case, when low muttering delirium, coma, and rarely convulsions, may precede death. The longest period known during which life was prolonged without any urine being passed is twenty days, but usually eight or nine days is the limit.

When the obstruction is due to renal calculus a *diagnosis* of its situation can generally be made from the localization of the renal colic which preceded the suppression. Usually, too, the history will indicate a former attack of renal colic on the opposite side, after which no stone was passed.

The *prognosis* is most unfavourable, unless the obstruction in the ureter can be overcome.

Treatment.—Medicinal measures are

of no use whatever. All treatment must be directed to a removal of the obstruction. Sir William Roberts has recommended kneading of the abdomen, in the direction of the obstructed ureter, changes of posture and succussion of the patient with a view to displacing the stone. It might be advisable, seeing that the stone is often impacted near the bladder, to attempt its dislodgment by catheterizing the ureter. Should all these measures fail, the ureter must be opened from the loin, above the obstruction, and a permanent ureteral fistula established.

ROBERT MAGUIRE.

URTICARIA (Nettlerash ; Hives ; Cnidosis).—An acute or chronic affection of the skin, and sometimes of mucous membranes, characterized by the development of wheals of ephemeral existence, accompanied by severe pruritus.

Symptoms.—Wheals (*pomphi*), which are pathognomonic of the disease, vary greatly in their characters; they may be as small as a pea, but usually are about the size of a finger-nail. They form with great rapidity, and seldom last more than a few hours, but they may appear in successive crops extending without interval over months or years. In their most typical form wheals are distinctly raised above the general surface, flat on the top, pale in the centre, bright pink at the periphery, and slightly harder than the surrounding skin. In shape they are usually circular, but sometimes oval, irregular or in streaks; they exhibit no grouping. In tissues which are lax (*e.g.*, eyelids, scrotum) and on mucous membranes the pale centre is not present, and vivid patches of erythematous redness are formed by the coalescence of large numbers of them. If the amount of serous effusion into the centre of the wheals be excessive vesicles result, but probably most cases of so-called *U. vesicans* are in reality examples of hydroa. Occasionally, too, the rupture of the extremely congested capillaries results in hæmorrhage, constituting *U. hæmorrhagica* or *Purpura urticans*. In children there is a special tendency for the migration of leucocytes in addition to the transudation of serum, and on the subsidence of the wheals inflammatory papules are left behind. Various clinical types meriting separate description are recognized, but these merge one into the other.

Acute Urticaria is often febrile; it is preceded by rigors and malaise, and the temperature may rise to 103° or

104° F. before the appearance of the rash. It frequently results from irritating ingesta (*vide* *Ætiology*), and may be accompanied by severe gastric catarrh and vomiting. The rash is usually very copious, and distributed with rough symmetry more or less over the whole body surface; the lesions are not grouped, and on the face they coalesce to form a sheet of vivid redness comparable to an erysipelas, while on the chest they may be mistaken for the rash of scarlatina. Œdema of the eyelids occurs, and the buccal, faucial, pharyngeal or even the laryngeal mucous membranes are often involved, causing dysphagia and threatening suffocation. In one case of frequently recurring attacks reported by the writer, the gastric mucosa appeared to be involved, as large quantities of blood were vomited with each recurrence. Temporary albuminuria has also been noted. The sensation of itching, burning or tingling is always intense and constitutes an important diagnostic feature. Fortunately, the duration of such cases is generally short, extending only over a few days, but occasionally they may be succeeded by a more or less **Chronic Urticaria**, which may last for months or years and prove a source of great annoyance, especially by causing sleeplessness, as the crops have a tendency to develop when the patient gets warm in bed. In other cases exposure to cold, even to the most trifling draughts, determines an attack. The outbreaks are not attended with appreciable fever, and the lesions present the ephemeral characters already described.

Papular Urticaria (*U. Papulosa*; *Lichen Urticatus*) is a variety which occurs only in children, and represents the link which connects urticaria with prurigo (*q.v.*). After the subsidence of the wheals persistent, hard, small, acuminate, inflammatory papules remain, the tops of which are crowned with blood-crusts as the result of scratching. These lesions are most common and persistent about the outer sides of the legs and thighs, on the buttocks and, generally speaking, on extensor surfaces. They not infrequently become vesicular, pustular or, on the palms and soles, even bullous, probably as the result of inoculation of pyogenic micrococci. From time to time acute crops of typical urticarial wheals occur, but these become gradually less and less frequent. The disease almost always occurs in the neglected children of the lower classes, and is often in the first instance the result of pediculosis or flea-

bites. It is very apt to be mistaken for scabies, but a careful study of its distribution, and the absence of burrows generally, render its differential diagnosis easy.

Urticaria Pigmentosa is a much rarer form, the relationships of which are not so manifest. It has been chiefly described by English dermatologists. The affection always begins in early infancy, and its course is very protracted, although it tends to spontaneous recovery at or about puberty. The lesions are permanent and pigmented; they are commonest on the trunk and neck, and consist of large, wheal-like tubercles, at first reddish in colour, but soon becoming dull yellow or buff. They are surrounded by a pink areola at first, and develop very rapidly. Small successive crops appear every few days, and ordinary urticarial wheals or factitious urticaria may be present. Occasionally they vesicate or become ecthymatous, probably as the result of scratching. The deeply pigmented tubercles persist unchanged for years. Although most cases are accompanied by severe itching, a few are not so, and in them no secondary lesions develop. Their diagnosis from xanthoma may be a matter of difficulty.

Giant Urticaria.—This term has been somewhat inaptly applied to a group of cases characterized by the sudden appearance of large, soft, œdematous swellings of the skin and subcutaneous tissue, which may measure several inches in diameter. They are specially prone to develop on the face about the eyelids, occluding the eyes. They may also attack the trunk and the limbs, especially in the neighbourhood of joints. The skin over them is usually of normal colour; there is no itching, and only some sense of tension is generally complained of. When the mucous membrane of the mouth, throat or larynx is involved—as not infrequently happens—the symptoms are alarming, but they generally subside with rapidity in the course of a few hours or days. The usual exciting causes are exposure to cold and disorders of digestion, but a considerable number of cases are associated with chronic rheumatoid arthritis. The disease may in exceptional cases extend over months or years, relapses occurring with regular frequency.

Ætiology.—The ill-balanced state of the peripheral circulation which predisposes to urticaria is commoner in children than in adults, in women than in men. Many cases result from external irritants applied to the skin; among

such may be included those due to rough flannel clothing, coarse aniline dyes, the stings of nettles, the “bites” of all sorts of pediculi, fleas, bugs, gnats, &c., the personal factor entering largely into the production, and determination of the severity, of the resulting lesions. Scratching or rubbing of the originally affected parts, acting as a further irritant, produces extension of the mischief, the secondary lesions thus caused generally greatly predominating over the primary. In the same way and for the same reason urticaria usually complicates all forms of itchy eruption, notably eczema, scabies, acute lichen ruber, prurigo and pruritus. In susceptible individuals, who are generally said to have “an irritable skin,” exposure to cold is a common excitant, and in them wheals may result from poultices, the application of electricity, the pressure of articles of dress, or from passing the finger-nail or any blunt instrument firmly along the skin surface (*U. factitia*). In this manner elaborate patterns may sometimes be traced on the skin, especially of the back.

The more important cases are, however, generally symptomatic of other conditions, especially of disorders of the gastro-intestinal tract and of the presence of toxic matters in the circulation. Thus many kinds of food are notoriously prone to cause urticaria, chief among which may be mentioned crustaceans and molluscs; occasionally fish of any sort, whether fresh, dried, smoked or potted, produces the same disagreeable result. Pork (especially in sausage form), pickled meats, cheese (especially toasted), eggs, pastry, porridge, cucumbers, nuts, mushrooms and pickles are often noxious, and, among fresh fruits, strawberries, grapes, gooseberries and raspberries are perhaps those which most frequently disagree. The number of articles of diet which may provoke nettlerash, however, is very large, and individual idiosyncrasies manifest themselves in the most remarkable manner. It is a point worthy of note that in many instances the eruption appears to be the result, not of a toxic substance in the blood, but of a true reflex action from the stomach, as it immediately ensues upon the ingestion of the peccant and almost as quickly disappears when the stomach is emptied by an emetic. Sometimes, too, the direct application of the excitant to the skin produces the same immediate effect as its ingestion.

Other conditions to which nettlerash is apparently sometimes reflex are—

dentition, the presence of intestinal worms (especially in children), the puncture or rupture of hydatid cysts and the passage of gall-stones; it may also result from pregnancy, parturition, operative procedures on the generative organs, menstrual disorders (especially at the menopause) and violent mental or moral emotions. The gouty diathesis and acid dyspepsia underlie many persistent cases, and attacks of urticaria may alternate with those of asthma, neuralgia, megrim or ague, and may occur with the periodic regularity and definite course of the latter disease.

Urticaria is also of comparatively frequent occurrence in connection with chronic Bright's disease, jaundice, lithiasis, diabetes, rheumatism and enteric fever, probably from irritant matters in the blood, and in the same category must be placed those cases which result from the administration of certain drugs—*e.g.*, copaiva, cubebs, opium or its alkaloids, quinine, chloral, turpentine, santalin, salicylic acid and the salicylates. The fact must be accentuated that neither in the case of *U. ab ingestis* nor in *U. medicamentosa* is the severity of the affection present proportional to the amount of unsuitable food or of the drug taken, but to the personal susceptibility of the patient. The most severe case the writer has seen occurred in a lad suffering from influenza, and in which no other plausible explanation could be found other than that it formed an integral part of that disease. It remains only to be said that in many cases, especially of the more chronic forms, no ætiological factor can be discovered, and the continuance of the affection is attributed to the establishment of "the urticarial habit."

The treatment of every case of urticaria must be directed mainly against its cause, if that be ascertainable. It is, however, impossible here to enter into the management of the very extensive list of morbid conditions which may underlie the disease. In an urticaria *ab ingestis* an emetic of ipecacuan or sulphate of zinc, or a subcutaneous injection of apomorphine, may be administered if the patient be seen soon after taking the noxious substance. This may be followed by a brisk purge of sulphate of magnesia. In more chronic cases the greatest care must be exercised in the selection of food, dyspeptic troubles must be treated on the ordinary lines, alkalies, bismuth and vegetable bitters being perhaps the most generally useful drugs. Regular and free action of the bowels must be

maintained. Alcohol, tea and coffee are often specially harmful. The most perfect hygienic surroundings must be obtained, and pediculi, fleas or other causes of external irritation must, of course, be removed. The skin must be kept scrupulously clean, and soft silk or fine linen worn rather than flannel underclothing, which is often rendered extremely irritating by its impregnation with aniline dyes. In many cases a warm bath every night is decidedly beneficial, and sulphide of potassium (3ij) or bicarbonate of soda (3vj) may advantageously be added to an average bath of 30 gallons.

Lotions containing liquor carbonis detergens (3j–5j ad 3vj), carbolic acid (3j ad 3vj), naphthol (gr. x–xx ad 3j) or bicarbonate of soda (gr. xx or more ad 3j) are generally useful, but Crocker points out, with reason, that any "disinfectant" is useful as an antipruritic. In many cases, the ætiology of which is quite obscure, certain drugs appear to act as specifics. Thus, arsenic is often curative, but care must be taken that the digestive functions are in good order. The same precaution is, oddly enough, not necessary for the applicability of ichthyol, which the writer is inclined to consider as of great value, especially in the nettlerash of women at the menopause. Owing to its nauseous taste it must be given in capsules or in sandarach-coated pills, the dose being gradually raised from 10 to 30 grains daily. Belladonna or atropine, pilocarpin, sulphate of quinine, bromide of potassium and colchicum are all sometimes useful and merit careful trial in obstinate cases.

J. J. PRINGLE.

UTERUS, CANCER OF.—Cancer may affect either the cervix or the body of the uterus. It is much more common in the cervix.

SYMPTOMS.—The main symptoms of cancer of the uterus are hæmorrhage, pain and wasting. Of these, hæmorrhage is the earliest and most constant. It is not uncommon for hæmorrhage following coitus to be the first symptom noticed. After the hæmorrhage there comes leucorrhœal discharge in the intervals of hæmorrhage, which becomes very profuse as the disease advances. It may be watery or yellowish. Pain is usually later than hæmorrhage. Occasionally the disease runs its whole course without pain. Wasting to a degree which attracts the patient's attention does not occur till comparatively late in the dis-

ease. The symptoms of *Cancer of the Body of the Uterus* are much the same as those of cancer of the cervix. The pain is of a somewhat different character, being more paroxysmal, and due to uterine contractions. The discharge, when the cancer has begun to break down, contains fragments of dead and decomposing tissue, and smells offensively. There is nothing in this at all characteristic of cancer, for fœtor of discharge may be produced by many causes. As the disease progresses, the hæmorrhage may be so great as to directly kill the patient. This is rare. It may produce anæmia which leads to fatty degeneration of the heart, and this to sudden death. Venous thrombosis and pulmonary embolism resulting therefrom may carry off the patient. The cancer may involve the peritoneum, and set up fatal peritonitis. Secondary growths may set up fatal changes in the organs in which they grow. One of the most common ways in which uterine cancer leads to death is by occlusion of the ureters and consequent uræmia.

DIAGNOSIS.—No reliance can be placed upon the symptoms or the history for the purpose of diagnosis, which can only be made by physical examination. In the later stages of cancer of the cervix or vaginal portion the diagnosis is easy: it is based on the presence of new growth enlarging the cervix, invading all tissues, and therefore fixing the uterus, and breaking down in the central part, thus producing excavated ulceration. In the early stages diagnosis is very difficult, and it may be impossible to make it without removing a piece of the growth for microscopical examination. In judging of the characters of such a piece, only the opinion of a microscopist familiar with the examination of uterine structures is of value. The diagnosis of cancer rests upon the discovery of epithelial ingrowths into the uterine tissue. The presence of irregular enlargement of one part only of the cervix, marked off from the rest, or divided into lobes, by fissures which do not run centrifugally, as do lacerations; and of a sharply defined warty growth, ulcerating in the centre, are characteristic appearances; but cancer so advanced as to exhibit these features will often be beyond the reach of treatment. An early sign of importance is a peculiar feeling of the cervix, so that its examination suggests that the finger is passing over wet india-rubber. The behaviour of the cervix to a tent has been said to be diagnostic:

that a cancerous cervix will not dilate, while one not cancerous will. This is certainly not correct.

In cancer of the body of the uterus, on vaginal and bimanual examination, the cervix is found healthy, and the body of the uterus enlarged. The diagnosis can only be made early enough to admit of treatment either by scraping the body of uterus with the curette, and examining the piece removed microscopically, or by dilating the uterine cervix and examining the cavity with the finger. The diffuse growth will then be felt. In the circumscribed form of uterine cancer it will be necessary to remove the polypus and examine it with the microscope.

PATHOLOGY.—**Cancers of the Cervix** are divided into two classes: (1) *Cancer of the vaginal portion*, and (2) *Cancer of the cervix*. Cancer of the vaginal portion is cancer beginning on the surface which lies between the os uteri externum and the attachment of the vagina. The vaginal portion, defined as above, is covered with squamous epithelium. Cancer of the cervix is cancer beginning in the part which lies between the os uteri internum and the os uteri externum.

(1) *Cancer of the Vaginal Portion* begins in the epithelium. It may begin at one point, or at several points close together. The appearance of this form of cancer in the early stage presents different forms. It may be a papillary or villous growth. This kind grows down into the vagina, and forms the so-called "cauliflower excrescence," a soft spongy villous mass which collapses after removal. It may, on the other hand, present in the earliest stage nothing but an area of lividity, or it may be first visible as a finely granular patch, or as a red tuberculated surface. The essential and important peculiarity of this form of cancer is that it is superficial, and does not involve the substance of the uterus till a comparatively late period of the disease, and the parametric tissues not till later still. It extends superficially, and in so extending does not tend to spread up the cervical canal, but advances outwards and downwards towards the vagina.

(2) *Cancer of the Cervix* begins in the glands of that canal. These glands increase in number and in size, and their ramifications become more various in shape. Their epithelium proliferates, and with the multiplication of the cells their shape alters, so that the glands instead of being lined by a single layer of columnar epithelium, become filled with cells of various shapes, often with

several nuclei. Thus they form tubes, strings, clusters, and nests of cells. The growth may commence either near the surface or in the deeper parts of the glands. It may begin either high up or low down in the cervix. The forms assumed by cancer in this part in its early stages are various. It may be polypoid, hanging from one of the lips of the cervix, or it may be a papillary growth on the surface, or it may begin as a nodule in the substance of the cervix. But whatever its characters in the early stages, its tendency is to quickly involve the whole thickness of the cervix and the cellular tissue around. It often also grows downwards, forming an excrescence projecting into the vagina, but it seldom extends upwards above the os internum until late. Briefly, cancer of the vaginal portion creeps along the surface towards the vagina; cancer of the cervix grows outwards and downwards in the substance of the cervix.

Cancer of the Body of the Uterus may be diffuse or circumscribed. The *diffuse form* is the more common. In it the whole or the greater part of the mucous membrane of the body of the uterus is covered either with villous growths or with wart-like protuberances. The irritation of the new growth causes hypertrophy of the muscular wall, from which cause, combined with the enlargement of the cavity caused by the new growth, the body of the uterus becomes considerably enlarged. In the *circumscribed form* the cancer projects like a polypus into the uterine cavity. In its growth it extends deeper and deeper into the uterine wall, at the same time that its projection into the cavity increases.

The disease begins in the glands of the endometrium. There are two forms, adenoma and true cancer. In the former, while the glands greatly proliferate, they remain lined by a single layer of columnar epithelium. In the latter, beside the increase in the size and number of the glands, the epithelial cells become heaped up, and of various sizes and shapes. As the interior of the body of the uterus is not accessible to simple inspection, we really know very little of the appearance in the early stages of cancer of the body. Cancer of the body of the uterus seldom extends to the cervix, but not uncommonly to the Fallopian tubes.

Cancer of the uterus in its further history presents the same characters as cancer elsewhere. It invades all tissues,

and as its edge advances its older parts break down and ulcerate. The lumbar glands enlarge and secondary growths appear in other organs. In the case of the uterus they appear later than in cancer affecting most other parts.

ÆTIOLOGY.—Cancer of the cervix is rare in the virgin and occurs chiefly in women who have had children. Statistics shew that the more labours a woman has passed through the greater is the liability to cancer. It has been attributed to the lacerations of the cervix which occur in almost all women who have had children, but the only scientific investigation which has been made into this question shows that it seldom, if ever, begins in the lacerated part. Therefore the supposed prevention of cancer is no valid reason for doing the operation of trachelorrhaphy. Cancer of the body of the uterus occurs with equal frequency in virgins, the married, and in those who have had children. Beyond these facts nothing more is known as to the ætiology of cancer of the uterus than of that of cancer elsewhere.

TREATMENT.—The classification of cancer given above is a practical and important one, because it corresponds to important differences in the amount of success which follows treatment.

Cancer of the Vaginal Portion can be diagnosed early, because the growth can be well seen, and a bit of it, if necessary, easily removed for examination; and, until it is far advanced, so that it has extensively invaded the vaginal wall, it can be removed. The treatment, so long as the disease is not too extensive, is to amputate the cervix. This part should be removed as high as possible, so as to get quite clear of the disease. The cervix should be pulled down to the vulval orifice by seizing it with a vulsellum. The practicability of so pulling it down is an important guide to the possibility of complete removal, not only because (1) the operation is easier when the cervix is well pulled down, but because (2) if on vaginal examination we do not perceive any very definite induration around the uterus, yet on attempting to pull down the uterus we find that the upper part of the vagina seems rigid, and is not easily inverted so as to let the uterus come down, that is an indication that the cellular tissue is involved. If the disease has spread to a small extent over the vagina, but has not affected the cellular tissue, the vagina will come down with the uterus, and the diseased mucous membrane, with a surrounding

zone of healthy mucous membrane at least one-third of an inch wide, should be dissected off and removed with the cervix. The results of this operation are very good, its danger is slight, and patients may go for years after it without relapse.

Cancer of the Cervix is less frequently amenable to treatment. As the part in which it begins is not always accessible to sight or touch, it is often not recognized until the time has passed within which successful treatment was possible: and, as its tendency is to grow outwards, towards and into the cellular tissue, it comparatively soon oversteps the limits within which its removal is possible. Still, if we are so fortunate as to meet with a case of cancer of the cervix before the growth has reached the cellular tissue, the proper course is to amputate the cervix. In removing the cervix for this variety of cancer, it is still more important than in cancer of the vaginal portion to cut well above the internal os uteri, so as to be sure that the whole cervix has been removed.

Cancer of the Body of the Uterus.—The only radical treatment is the removal of the whole uterus. The collective mortality following this operation has until recently been not far off one in four, but modern improvements in operating (especially the use of pressure forceps) have reduced the mortality, in the hands of skilful operators, to about that of ovariectomy. For a full description of this operation works on surgery must be consulted.

If a case of cancer of the uterus be not seen until too far advanced for removal, all that can be done is to relieve symptoms by palliative treatment. Pain can be eased by morphine, and this may be given in doses as liberal as are required. Patients usually soon become tolerant of the nausea produced by it. It is best given in the form of hypodermic injections, for thus the least ill effect is produced. Fœtor of discharges can only be overcome by great cleanliness, frequent douching, and an unlimited supply of clean napkins. When hæmorrhage is great, it can be for a time arrested by scraping the surface of the growth with Simon's sharp spoon, so as to remove the part of the growth which is breaking down and get to a part where the cancer is mingled with healthy tissue. In cancer of the body this step often gives marked relief to pain as well as to hæmorrhage.

G. E. HERMAN.

UTERUS, CORRODING ULCER OF.—This is a rare disease, consisting in an ulcer which spreads, destroying as it does so all the tissues in its way. In this it resembles cancer. But it differs from cancer in that there is no induration, or evidence of new growth, in its edges or base; that on microscopic examination of its base or edge no evidence of cancer is found, but only the appearances of simple ulceration; that its progress is slower, and its course longer than that of cancer, some patients living ten years or more, and finally dying of some other disease; that it is not attended with such emaciation as is usual in cancer, nor with such severe pain; and that hæmorrhage is less frequent. It seldom occurs before the climacteric. It has been suggested that it may be analogous to lupus or to senile gangrene, but recorded cases are too few to establish its pathology. No successful treatment has yet been carried out.

G. E. HERMAN.

UTERUS, DISPLACEMENTS OF.—The displacements of the uterus are described in the following order:—

1. Lateriversion.
2. Ante flexion.
3. Anteversion.
4. Retro flexion.
5. Retroversion.
6. Descent of the Pelvic Floor.
7. Prolapse of the Uterus.
8. Inversion.

The uterus in healthy women has not always the same position and shape. The organ is not always in the middle line, and, if it originally occupy a nearly central position, it may be dragged towards one side by adhesions.

Much importance has of late been attached by German writers to the effect of perimetritic and parametritic adhesions in producing uterine displacements. There is no doubt that by adhesions the uterus may be displaced in the most various ways. But such displacements are of little clinical importance: first, because in the great majority of such cases the symptoms produced by the pelvic inflammation are not appreciably modified by the displacement of the uterus; and secondly, because in the rare cases in which the displacement appears to interfere with the uterine functions, it is quite irremediable by any justifiable treatment.

1. *Lateriversion.*—This term has been applied to the deviation of the uterus from the central position, and mechanical

appliances have been recommended for its treatment. It is quite consistent with health, and therefore requires no treatment. If it did, there is no means, mechanical or other, by which the position can be altered.

2. **Anteflexion.**—In the majority of unmarried women and in a large proportion of parous women the uterus is not straight, but is bent forward so as to be concave in front. To this condition many evil consequences were formerly attributed, and instruments devised for its alteration. It is now known that it interferes in no way with health, comfort, or fertility, and that, even were it necessary, it is not possible to permanently straighten an anteflexed uterus by any appliance. Childbearing generally makes the uterus more nearly straight than it was before.

3. **Anteversión.**—The position of the uterus varies according to the degree of fullness of the bladder. When the bladder is full, the uterus lies in or behind the axis of the pelvic inlet; when empty, the uterus falls forward, so that often its whole length can be felt through the anterior vaginal wall. This is called anteversion, and, like anteflexion and lateriversion, has been considered a disease, and treated as such. It is a normal state of things, requires no treatment, and cannot be altered by treatment.

4. **Retroflexion.**—In some women the uterus is bent backwards, so as to be concave behind. The above term is applied to this condition.

5. **Retroversion.**—The organ is sometimes turned backwards without being bent, so that the uterine body can be felt through the vagina. This is called retroversion.

Cases of retroversion and retroflexion may be divided into four classes:

(1) *Without Symptoms.*—Retroflexion and retroversion (which are generally combined) may be present without interfering in any way with health or with the uterine functions; they therefore do not always require treatment.

(2) *With Symptoms due to other Conditions.*—It is obvious that the existence of displacement of the uterus backwards does not protect the patient from other diseases, and that therefore, if symptoms referred to the pelvic organs exist along with backward displacement of the uterus, it does not follow that the latter condition is the cause of the symptoms. The displacement must only be blamed when every other morbid condition can be excluded, and the

symptoms are such as the displacement is known to cause.

(3) *With Symptoms of Prolapse only.*—In the early stage of prolapse as the uterus sinks it often becomes displaced backwards. In that case, while the symptoms of prolapse are present, the backward displacement may be the most distinct alteration in the position of the uterus.

The *symptoms* are pain, referred to the lower abdomen, sacral region, and thighs, the pain being of a dragging, bearing-down character; constant, not paroxysmal; aggravated by exertion, relieved at once, and soon entirely removed, by recumbency. There is irritability of the bladder, constipation is usual, and the straining which accompanies defæcation is painful to the patient. To strong robust women such symptoms are trifles, but these displacements are more common in nervous weakly women, who also suffer from atonic dyspepsia, sleeplessness, neuralgic pains, nervous exhaustion and hysteria. The train of morbid phenomena forms a vicious circle. Weakness of the nervous system favours the occurrence of functional failure of various kinds, and also makes the nervous system more sensitive to the painful sensations which such failure produces; the presence of local discomfort in its turn reacts upon, and further weakens, the exhausted nervous system.

(4) *With Symptoms of Prolapse and Congestion.*—In some women, the disposition of the peritoneum in the pelvis is such that two firm bands run from the uterus back to the sacrum. With this arrangement of parts, if the body of the uterus gets displaced backwards, and pressed down between these bands, the veins which run from the body of the organ outwards in the broad ligament are compressed, the return of blood is impeded, and congestion of the body of the uterus is the result. In these cases the pain is more severe, and is not relieved by recumbency until that position has been maintained for some days; the uterus is very tender to the touch; menstruation is often very profuse and prolonged. Pain and hæmorrhage in this affection are, as a rule, in inverse proportion to each other, copious hæmorrhage relieving congestion and therefore pain. There is not only irritable bladder, but some smarting on micturition, and leucorrhœal discharge.

Backward displacement of the uterus is often, but not always, associated with erosion of the cervix, as vessels run

vertically downwards from the body into the cervix and are therefore liable to be compressed if the uterus be bent, and with prolapse of the ovaries.

Prognosis.—This depends very much on the amount of prolapse. If this be great, the patient may need either to wear a support, or put up with the inconvenience of prolapse, for an indefinite time. If the descent of the uterus be only slight, it may be that after the uterus has been kept supported at its proper level for one, two, or three years, the pessary may be left off without return of the symptoms. The correction of the flexion is not of importance for the relief of symptoms; the falling downwards and backwards of the uterus is the essential condition, not the bending.

The *treatment* of retroversion and retroflexion, when treatment is necessary, is to support the uterus with a pessary. For complete relief it is desirable that the uterus be raised into a position of anteversion. In effecting this the pessary converts the uterus itself into a lever, the body of the uterus being the weight, the fulcrum the anterior attachment of the uterus to the bladder, and the power the traction of the posterior vaginal wall (pushed up by the pessary) on the cervix. This is most perfectly effected by Hodge's pessary, or one of its modifications. This pessary is made of pewter, vulcanite, or celluloid; pewter is more readily moulded, but sometimes causes pruritus. There is a useful form made of spring wire, covered with india-rubber, the anterior ends being separated by india-rubber only, so that the ends can be approximated for ease of introduction. Hodge's pessary is sometimes difficult to adjust, and sometimes, especially in cases of acute flexion, will fail to raise the uterus into a position of anteversion. If it fail to do this, and the uterus be congested, the pressure of the pessary will aggravate the pain. In such a case the best pessary is a thick ring made of a watch-spring covered with india-rubber. If prolapse of the ovaries be present, this pessary is indicated, as even if it should not antevert the uterus, its thickness and softness prevents the pressure from causing pain. Whatever pessary be used, it should fill the vagina, but not make its walls tense. A good practical guide to the size will be found in this rule:—Choose a ring in diameter one inch less than the posterior vaginal wall, measured from the posterior *cul-de-sac* to the vulva.

All india-rubber pessaries are apt to

cause vaginitis, with offensive discharge. The patient should therefore be instructed, while wearing one, to syringe the vagina with warm water night and morning. If there be pruritus, some borax may be added to the water. The pessary should be removed, and the parts examined to detect any ill effects that may have been produced, such as ulceration, at least once in three months.

Before considering prolapse, a condition must be described which accompanies it, and is indeed the first step in the process, viz.:—

(6) *Descent of the Pelvic Floor.*—This condition accompanies all the most pronounced cases of prolapse. But it may occur by itself, without any appreciable change in the relative position of the uterus. There is always in health some change in the pelvic floor. It descends with inspiration and during effort, and ascends with expiration and when effort ceases. The amount of descent in most healthy women does not exceed half an inch. It is greater in women who have borne children. In women in whom the pelvic floor has been weakened by childbearing, and the muscular tone lowered by debility, the descent may be much greater, and may be attended by symptoms much the same as those of uterine prolapse. These are relieved by a perineal support. They vary with the tone of the patient's nervous system, being a source of distress when the nervous system is depressed, but hardly felt at other times.

7. *Prolapse of the Uterus.*—This term is applied to those cases in which the uterus is distinctly lower than it should be. It is customary to distinguish three degrees of prolapse: the first degree when the uterus has not descended below the vulvar orifice; the second when the cervix has protruded externally, but not the whole uterus; the third degree, or *procidentia*, when the whole organ is outside.

This condition usually begins with descent of the anterior segment of the pelvic floor—i.e., the anterior vaginal wall and bladder. As the anterior vaginal wall sinks downwards, it drags the cervix after it. When the cervix is thus dragged down, while the body is held by its peritoneal and other attachments in or near its normal position, the effect is to stretch the part of the cervix above the vaginal insertion; and therefore, in prolapse of the second degree, it is the rule to find the uterine cavity measuring from 4 to 5 inches in length.

That this elongation is due to stretching, although it is sometimes spoken of as hypertrophy, is shown by the fact that when cases of prolapse of the second degree, with elongation of the cervix, advance to procidentia, as the traction of the cervix from the body which caused elongation no longer exists, the uterus resumes its normal length. The cervix uteri in descending drags the posterior vaginal wall after it. When the uterus is completely outside, it lies in a bag formed by the inverted vagina, which becomes dry and scaly. In prolapse of the second degree, the cervix being constricted by the vulvar orifice, the part outside becomes much congested and swollen. This change disappears when the case goes on to procidentia. The protruded parts, both cervix and vagina, are liable to ulceration, which is mainly the result of friction. These ulcers heal when the uterus is replaced and maintained in position. There are cases in which the descent of the parts does not take place in this order, but they are quite rare and exceptional.

The *symptoms* of prolapse have been already described. There is a dragging, bearing down pain, relieved by recumbency, and made worse by exertion. The bladder is irritable, and there is smarting pain on micturition. The act of defæcation is attended with discomfort; a leucorrhæal discharge is usually present.

Prolapse is a condition which is met with chiefly in the labouring class.

Treatment.—The best treatment is to keep up the uterus by one of the forms of cup and stem pessary. The cup receives the cervix, and the stem has attached to it elastic bands which are tied to a waist-belt. The pessary may be made of gutta-percha, vulcanite, earthenware, or india-rubber; of these, earthenware is the cleanest. An instrument 3 inches long, with a cup 2 inches wide, is of the size most generally useful.

In slight cases one of the forms of Hodge's pessary or a thick ring may be sufficient. But these can only be retained where there is not much dilatation of the vaginal orifice, and they are therefore ineffective in the extreme cases of prolapse.

If a pessary with external straps be objected to, a plastic operation to contract the vaginal orifice may be performed. But this will not do more than make it possible to keep the uterus up with a vaginal pessary.

Alexander's Operation, or the shortening of the round ligaments, has been recommended for backward displacements of the uterus and for prolapse. For prolapse it is useless; because in prolapse there is descent, not only of the uterus, but of the vagina, and this operation only alters the position of the uterus. Cases of backward displacement of the uterus without descent of the vagina, which cause symptoms enough to make the patient an invalid, and yet cannot be relieved by a vaginal pessary, may be completely cured by Alexander's operation. It is not free from risk, but this is less than that attending treatment with an intra-uterine pessary, and, if successful, it cures, which an intra-uterine pessary never does.

It has been recommended to open the abdomen, and stitch the uterus to the abdominal walls. This measure is no doubt for a short time efficient; but knowing how peritoneal adhesions may stretch and even disappear, it is hardly to be expected that the permanence of an adhesion so produced could be relied upon; and no cases have yet been published showing the duration of relief afforded in this way.

8. *Inversion*, or turning inside out, of the uterus, is fortunately rare. It most often occurs after delivery, and is due to contraction of the cervix coinciding with relaxation of the body of the uterus, so that while the latter is pushed or pulled downwards through the os uteri, the cervix contracts and prevents its returning. In the unimpregnated state it may occur from the traction of a fibroid, either during its spontaneous expulsion or as it is being pulled down for removal by the surgeon.

Cases of inversion of the uterus are divided into *acute* and *chronic*. Acute inversion is the form which follows delivery. It may be caused by traction on the cord either by the medical attendant in attempting to remove the placenta, or by the child in consequence of the cord being too short, or from its being twisted round its body. But it may also occur without any traction, if the uterine body be relaxed, and it is important to bear in mind that it may thus happen without any fault of the medical attendant.

The *symptoms* are collapse and hæmorrhage. On examination, a sensitive tumour, the size of the uterus, surrounded at its base by the cervix as by a collar, will be found projecting into the vagina. On examination of the

abdomen the body of the uterus is not to be felt in its proper place. The *treatment* is to push up the inverted uterus with the hand. This is most easily done by pressing somewhat laterally, so as to push up first one side, then the other. The sooner replacement is attempted after the inversion has occurred the easier is it. If long delayed it may be difficult even with chloroform, and the case may require to be treated as one of chronic inversion.

If acute inversion of the uterus be left unreduced, the organ undergoes involution just as is the case when it has not been inverted. When involution is complete the condition is called *chronic inversion*. The inverted uterus is sensitive to the touch, and bleeds almost continuously, watery or purulent discharge being present in the intervals of hæmorrhage.

The *treatment* of chronic inversion is to replace it by continuous elastic pressure. The best repositr is Aveling's. By this instrument reduction can almost always be effected within three days, and generally in a shorter time. No other treatment is at the present time justifiable.

G. E. HERMAN.

UTERUS, FIBROIDS OF (Fibroid Tumours; Fibro-myomata). — These are the commonest tumours which grow in the uterus. They are classified, according to their position, into *sub-mucous*, *interstitial* and *sub-serous*. They are all interstitial growths at first, and, as they enlarge, some come to project into the uterine cavity (sub-mucous), and others on the peritoneal surface of the uterus (sub-serous).

Fibroids are also classified according to their structure; some consist of concentrically arranged fibro-muscular tissue, or of several masses so formed, and appear as round, hard nodules distinctly encapsuled. They can easily be shelled out of their capsule, are less vascular than the other kind, and on section are pale in colour. These have been called *hard*, *white* or *nodular* fibroids. In them fibrous tissue is relatively more abundant; therefore some writers restrict to them the term "fibroma." Others are much softer, more vascular, redder on section, are not formed of concentrically arranged fibres, but of fibres which interlace in all directions; they are not encapsuled, but so closely blended with the surrounding tissue that they cannot be shelled out; and they do not form nodules, but a general enlargement of the uterus concentrically surrounding

the uterine cavity. These have been called *soft*, *red* or *concentric* fibroids, and in them muscular tissue is relatively more abundant; therefore they are by some writers called "myomata."

SYMPTOMS. — **Sub-serous Fibroids** cause trouble chiefly by their size. They may grow to be as large as any tumours met with in the body, reaching a weight of 50 or 60 lb., or even more. When they reach this great size they may cause much suffering and danger by their pressure on important parts. By enlarging the abdominal cavity, and so pressing the diaphragm upwards, they may cause dyspnœa. By pressing on the stomach they may cause vomiting. Intestinal obstruction may be the result of pressure on the bowel. Pressure on veins may cause œdema of the lower extremities, and pressure on the urethra may give rise to retention of urine and its consequences; or one or both ureters may be occluded by pressure. These tumours may produce the pressure results thus enumerated, not merely by their size when in the abdominal cavity above the pelvis, but, when no larger than a foetal head, they may get locked in the pelvis, and thus exert injurious pressure on parts within that cavity, or they may get so tightly incarcerated as to become gangrenous. The degeneration, softening, and escape of the products of degeneration of these fibroids may cause peritonitis. Such peritonitis may be fatal, but if not fatal it results in the production of adhesions. Such adhesions may enable a tumour to produce effects by its pressure which would not have happened had the tumour been free to move. It may even happen that the tumour comes to receive its blood-supply through an adhesion, and that the traction exerted by an adhesion may elongate, perhaps twist, and finally break off the connection between the fibroid and the uterus. Fibroids which are entirely sub-serous seldom have much effect upon menstruation.

Sub-mucous Fibroids (with which, for clinical purposes, the soft or "concentric" growths spoken of by some as "myomata," must be classed) are chiefly important because they produce hæmorrhage. When of the hard or nodular kind they are generally single, and seldom reach a great size. A sub-mucous fibroid larger than a foetal head is rare. By projecting into the uterine cavity they enlarge it, and the irritation of their presence causes the uterine mucous membrane to undergo thickening and

vascularization to such a degree that some have termed the condition endometritis. The vascularity of the mucous membrane and the increase in its area causes profuse, long-continued and often repeated hæmorrhages, with leucorrhœal discharge in the intervals of hæmorrhage. There is often dysmenorrhœa, often also irritability of the bladder and slight pelvic pain. But the hæmorrhage is the important symptom, for through it the patient is made an invalid. Death directly from hæmorrhage is rare, more commonly such patients, if not cured, die from some condition the result of the anæmia induced by the hæmorrhages.

As already stated, all fibroids are interstitial in the beginning, and, as they grow, bulge either towards the peritoneum or towards the uterine cavity. But they may enlarge in both directions, especially when multi-nodular, and may reach a considerable size while covered on each aspect by a layer of muscular tissue, altering the external shape of the uterus and enlarging and distorting the uterine cavity. In such cases there will be menstrual troubles, such as are produced by sub-mucous growths, and there may be also symptoms resulting from pressure or from peritonitis and subsequent adhesions.

CHANGES IN FIBROIDS.—Fibroids are liable to various changes. They *enlarge* slightly before each menstrual period, and very much during pregnancy, if it take place. They may become very *œdematous*, and the fluid exuded may separate the fibres and lie in interstices of irregular shape between them. Thus is formed the so-called "fibro-cystic" tumour. The term "fibro-cystic" is not quite appropriate, because in such tumours there are, as a rule, no true cysts, but merely irregular spaces between the fibres containing fluid, but having no epithelial lining. There may be more than œdema—viz., *myxomatous degeneration*. There may be *suppuration*, or, what is more common, *breaking down* of part of the tumour, and conversion into a granular detritus. This often takes place at parts of the tumour, and, by opening of such softened spots and escape of débris into the peritoneum, peritonitis may be produced. The writer has known a suppurating fibroid discharge pus copiously into the uterine cavity, but this is rare.

Fibrous tumours may undergo *calcification*—that is, there is a deposit of calcareous salts around the periphery of the tumour, or in streaks through its

centre, together with shrinking and hardening of the whole mass. This change occurs in the sub-serous fibroids of old women. *Gangrene* of the whole tumour may occur either from inflammation and suppuration of its capsule, or, in the case of a sub-serous growth, from twisting of its pedicle, or from a tumour getting wedged and compressed in the pelvis. Disintegration of uterine fibroids is often spoken of as *gangrene*. A natural mode of cure of sub-mucous tumours is by their *expulsion* through the cervix into the vagina, and the slow elongation, thinning and at last parting of the pedicle and separation.

Disintegration and expulsion of sub-mucous fibroids in the form of loose fibrous débris also occurs, though rarely. Such disintegration is not attended with grave symptoms until the disintegrated tissue reaches the lower part of the vagina, when putrefactive germs get access to it, and decomposition of the dead tissue and blood-poisoning from absorption of the products of putrefaction result. If the patient be seen before this has happened, timely treatment with antiseptic injections will prevent it. This form of degeneration is interesting clinically, because the loose fibrous débris presenting at the os uteri feels very like placenta, for which it has often been mistaken, thus giving rise to unfounded suspicions.

Lastly, many isolated cases have been published in which tumours diagnosed by competent observers as uterine fibroids have disappeared, and it has been believed that the tumours have been *absorbed*. In most such cases the absorption has taken place during the lying-in period.

DIAGNOSIS OF FIBROIDS.—This is made by physical examination. It is generally easy, but may be difficult, or impossible. The important signs are, first, that the tumour, on bimanual examination, is found to be continuous with the uterus, and to move with it. Next, that sub-peritoneal, multi-nodular tumours are very hard, and are made up of a number of masses, each having a rounded outline. Should a sub-peritoneal fibroid have a long pedicle, it may be impossible to distinguish it from a solid ovarian tumour. Sub-mucous fibroids produce uterine enlargements, which it may be difficult to distinguish from pregnancy. The diagnosis will be made from the fact that the enlargement due to a fibroid is seldom quite as regular in

shape as that of pregnancy, and also the softening of the cervix and the bluish tint of the genital mucous membrane are absent in the case of the fibroid. Between a small fibroid and cancer of the body the diagnosis may be difficult, and indeed impossible without a digital exploration of the uterine body after dilatation of the cervix. This proceeding will be necessary for treatment as well as diagnosis if there be copious hæmorrhage with slight uterine enlargement. A fibroid projecting from the uterus laterally may much resemble the swelling formed by a thickened and dilated Fallopian tube. If in addition there have been pelvic peritonitis matting the pelvic organs together, the diagnosis will be still more difficult, and may be only possible after abdominal section. The diagnosis (previous to that proceeding) depends mainly on the much more severe pain which accompanies disease of the tubes.

ÆTIOLOGY.—Nothing is known about the ætiology of fibroids. They occur chiefly in women between thirty-five and forty-five. It is rare to find them before twenty-five, and rare also for their growth to begin after the menopause. They occur alike in the virgin, the married and the parous.

TREATMENT.—As the majority of uterine fibroids (taking all classes together) produce no serious symptoms, they require no treatment. Sub-serous fibroids of such size as to cause grave pressure symptoms can only be effectively treated by removal. If locked in the pelvis, they should be pushed up either manually or by hydrostatic pressure.

Sub-mucous fibroids are spontaneously cured in two ways. First, by their disintegration and piecemeal expulsion. This is rare; and attempts to bring it about artificially such as have been advocated, are attended with more probability of harm than good. Secondly, by their gradual expulsion from the uterus, first into the cervical canal, then into the vagina. In this process the attachment of the tumour to the uterus gradually becomes thinner and longer, and it may be spontaneously severed, and thus the cure completed. This process may, however, take years to accomplish, but the most satisfactory treatment of sub-mucous fibroids is the acceleration by art of this natural process.

Fibrous Polypus.—A fibroid tumour lying in the cervix or vagina, attached to the body of the uterus by a thin stalk, is thus termed. If it be found *in the vagina*

the treatment is to cut through its stalk either with scissors or the écraseur. If the attachment of the tumour to the uterus be extensive and close, it may be that, instead of the neck of the tumour elongating and a polypus being formed, the tumour drags down the body of the uterus, and thus inversion of the uterus is produced. In the case of a seeming polypus, if it be about the size of the fundus uteri, it should be remembered that, to the vaginal touch, an inverted uterus and a polypus about the same size feel very much alike. In both there is a rounded swelling projecting into the vagina and surrounded at its base by the cervix uteri. The diagnosis is to be made either by bimanual rectal examination, by which, if the tumour be a polypus, the body of the uterus will be felt in its natural place above the cervix; or by the sound, which, in the case of a polypus, will pass $2\frac{1}{2}$ inches or more beyond the os externum, but in an inverted uterus will not pass more than about $\frac{1}{2}$ inch.

In the case of a tumour *in the cervical canal*, the lower part of the cervix being stretched over it and the external os dilated—if the tumour be small, that is, not larger than a walnut, it may be seized, pulled down and twisted off. If the os be not large enough to allow this, it may be enlarged by incision, or by waiting a few days and giving full doses of ergot, which will produce further dilatation of the cervix, but which has the disadvantage of being accompanied by further hæmorrhage. If the tumour be larger than the size of a Tangerine orange, and within the cervix, it should be removed by enucleation. It has been said that there is a secret in the enucleation of fibroids. The secret is to select cases in which the cervix is expanded and the os externum dilated to the size of a florin or larger, to use antiseptic precautions, and not to try to drag by force a large tumour through an undilated cervix, but to cut the tumour up into small pieces, removing a piece at a time, and dragging down a fresh piece as room is gained by removal of its predecessor. In this way the writer has enucleated a tumour weighing $2\frac{1}{2}$ lbs.

Sub-mucous fibroids *not expanding the cervical canal* and causing hæmorrhage can generally be effectively treated by ergot, which, by making the uterus contract and contracting the arterioles, reduces the hæmorrhage to limits consistent with health, and often diminishes the size of the tumour. The ergot

should be given in $\frac{1}{2}$ -drachm doses of the liquid extract, three times daily, continuously for at least three months, unless something else be needed before that time has expired. It has been given by hypodermic injection; but the advantages of this method are so slight as not to counterbalance the disadvantages. The beneficial results mentioned follow the use of ergot in three-fourths of the cases. If benefit accrue, the ergot may be continued without intermission for twelve months or more. If the uterine contractions from the ergot should be very painful, they may be obviated by the addition of gr. x of antipyrin to each dose. In some cases ergot fails to do good, and in a few it appears to increase the hæmorrhage. This latter result is sometimes due to the uterine contractions forcing down the tumour and rupturing veins running in its capsule. Fatal hæmorrhage has been known to occur from rupture of such veins. There is no drug besides ergot which has any definite effect upon uterine fibroids or the hæmorrhage they cause.

Lately, a method of treatment by electricity has been introduced. This consists essentially in passing a very strong continuous current (100–300 milliamperes) through the tumour, one electrode being placed in the uterus, the other on the abdomen. Injury to the abdominal wall from so strong a current is prevented by using as an electrode a large poultice-like sheet of potter's clay. The intra-uterine electrode exerts a cauterizing effect on the mucous membrane, and so checks hæmorrhage. It is said also that the current exerts what is called an "electrolytic" action on the tissue of the tumour through which it passes, and diminishes its size. No proof of this has yet been adduced. There is some danger attending this treatment, for it has been followed by death, but the sources of danger have not yet been defined. The published results show that this treatment is not so effective as that by ergot, and, in addition, it is less safe. But in cases in which ergot fails and operative treatment is unadvisable, electrical treatment may properly be tried.

If hæmorrhage be considerable enough to affect health, and ergot fail to lessen it, removal of the uterine appendages should next be considered. If the tumour be small and movable and the patient's health not much affected, this is, in competent hands, an easy and safe operation. If the tumour be large, the ovaries are

often displaced and the folds of the broad ligament are spread out, so that the uterine appendages cannot easily be pulled up and ligatured; if it be immovable, the appendages may be found imbedded in firm adhesions; and if the patient be extremely anæmic, there is danger from thrombosis after the operation: these conditions, therefore, much increase its danger. If the appendages are successfully removed, cessation of hæmorrhage and shrinking of the tumour follow in the great majority of cases.

If these methods fail, nothing remains but hysterectomy. But cases are exceedingly rare in which this is required.

G. E. HERMAN.

UTERUS, HYPERTROPHY OF.

—Increase in size of the Body of the Uterus sometimes remains after child-bearing, the condition has been called *hypertrophy*, but it is usually termed *sub-involution*, and is described under that name. The body of the uterus becomes increased in size and thickness whenever new growths are contained in its walls or cavity. This hypertrophy is secondary to the growths, and is in itself unimportant.

Hypertrophy of the Cervix Uteri.—

There are three kinds of enlargement of the Cervix to which the term hypertrophy has been applied. (1) Chronic inflammation of the cervix producing general thickening. When this thickening is great, good may come from amputation of the cervix. (2) In prolapse the traction on the cervix by the proeident vagina elongates that part of the cervix which is above the insertion of the vagina. By some this has been called hypertrophy; by others, elongation; by others again, *hypertrophic elongation*. Reasons for thinking that it is lengthening of the cervix by stretching rather than overgrowth are given in the section on Prolapse (p. 908). But, although usually so produced, it may be due to overgrowth. A specimen in the Hunterian Museum shows hypertrophy of the infra-vaginal part of the cervix in the anterior lip; of the supra-vaginal portion of the cervix, in the posterior lip. Here the supra-vaginal hypertrophy cannot have been due to stretching, and is not accompanied with thinning. (3) Hypertrophy of the vaginal portion of the cervix may be a congenital malformation. The writer has seen and published cases of its occurrence in two sisters. If slight descent of the uterus take place, the hypertrophied

cervix protrudes at the vulva, and the condition simulates the second degree of prolapse. The hypertrophy appears to favour the occurrence of prolapse. This form of hypertrophy is recognized on endeavouring to replace the apparent prolapse, when it is found that, when the uterus is pushed as high as possible, the distance between the vaginal insertion and the os externum is not diminished.

The *treatment* is to cut off the infra-vaginal portion of the cervix, either with knife or scissors, the mucous membrane of the cervical canal being sutured to that of the external surface of the cervix, or the galvano-cautery wire may be used.

G. E. HERMAN.

UTERUS, INFLAMMATION OF (Metritis).—**Acute Metritis** occurs in the puerperal state as a result of septic infection (*see* PUERPERAL FEVER). In the non-puerperal woman it is sometimes seen as a result of rough treatment of the uterus, as in the removal of tumours; from the use of tents without proper precautions, or from the wearing of intra-uterine pessaries. It is generally believed that it may result from suppression of menstruation, or from sexual excesses, but from such causes it is at least rare. It is associated with endometritis, and quickly leads to peritonitis.

The *symptoms* are that, in addition to the hæmorrhage or discharge which endometritis produces, the uterus is swollen and tender.

Treatment consists in absolute rest in bed, the administration of laxatives, leeches to the inguinal regions if the patient be full-blooded, counter-irritation to the abdomen in the form of poultices of linseed mixed with mustard or sprinkled with turpentine, potassium bromide if there be much reflex excitability, the removal of any pessary or tent, and discontinuance of any interference with the uterus.

Chronic Metritis is one of the most common, and yet ill-understood, diseases that occur in women.

Symptoms.—The affection is assumed to be present when the uterus is large and tender, and the patient, without any other morbid condition being present to account for it, suffers from chronic pelvic pain. The pain is not very severe, but lowers the tone of the nervous system by its continuance, and is increased at the menstrual period. It is generally stated that in the beginning of the disease the menstrual flow is in-

creased in quantity, while later on it is diminished; but if this be the rule, exceptions are numerous. There is usually some leucorrhœa, from accompanying vaginal catarrh and cervical endometritis. There is often irritability of the bladder and slight scalding in micturition. Dyspareunia is usual. The pelvic symptoms are usually accompanied by those of atonic dyspepsia—capricious appetite, fulness after meals, flatulence, constipation—and by such symptoms of nervous exhaustion as loss of energy, depression of spirits, muscular weakness, disturbed sleep, inability to sustain thought, frequent headaches, vertigo and hysterical seizures. This train of symptoms is generally of long standing, and is often dated back to a labour which was followed by a convalescence slower than usual or interrupted by illness. A similar group of morbid phenomena is sometimes seen in women who are sterile, or comes on during a period of sterility following a period of fertility; and in some at least of such cases is due to efforts to prevent conception. It has been attributed to laceration of the cervix, but without the slightest evidence, and there is abundant proof to the contrary. It may be produced by too much local treatment of the uterus. From the circumstances of its origin, its persistence and chronicity, and the kind of treatment that is found effectual, the increased size and tenderness of the uterus is believed to be due to chronic congestion and inflammation. It is suggested that in the earlier stage it is congested (hence the increased menstrual flow), and that later the inflammatory exudation has become organized into fibrous tissue, which thickens and hardens the uterus, compressing and even obliterating vessels, and hence making menstruation scanty. Some who think the evidence of inflammation insufficient, but nevertheless accept as a fact the presence of an excess of fibrous tissue in the uterus, call the disease "chronic areolar hyperplasia." But the morbid changes, whatever they may be, have never yet been demonstrated. Those that have been pointed out are not peculiar to this disease. There is no evidence that there is any more fibrous tissue in these large tender uteri than there is in uteri which, although large, are not tender. The strongest argument in favour of the disease being really due to congestion is the benefit that follows treatment which depletes the pelvic vessels.

The success of treatment depends upon

the stage at which the opportunity for it occurs. Recent cases can be quickly cured, but in those of long standing treatment is not followed by good results.

Treatment.—Rest is most important, but it may be difficult to induce the patient to keep her bed for a malady which does not seem to require it, but if she can be induced to do so the effects of treatment will be greatly helped. If the patient be florid and menstruation scanty, four or six leeches should be applied to the cervix uteri, when aggravation of pain indicates the approach of menstruation. A hot vaginal douche should be used night and morning. After the douche, a plug of cotton-wool saturated with glycerin, and tied to a piece of string to facilitate removal, or, better, a pessary of glycerin and gelatin (gelatin ʒj, glycerin ad ʒij), should be inserted. To the latter, if there be much soreness and irritation, gr. xx of boric acid may be added. Alcohol should be forbidden. The bowels should be regulated, it being better that they should be loose than confined. Disorders of digestion must be treated in appropriate ways, and tonics given, with draughts of ammonium bromide (ʒss) if there be sleeplessness. If the patient can be induced to keep her bed, and the case be recent, a month or two of this treatment will probably remove the symptoms. It has been proposed, and practised in intractable cases, to remove the ovaries; but in the cases which have come to the knowledge of the writer this has not proved beneficial. Treatment is likely to be more efficient if the patient can be taken from her home, and in some cases, but by no means in all, this is essential. G. E. HERMAN.

UTERUS, MALIGNANT ADENOMA OF.—A rare disease, consisting in a fungous overgrowth of the mucous membrane of the uterus.

Symptoms.—Quite in the beginning it may be difficult or impossible to distinguish this disease from fungous endometritis, for detached portions of the overgrown mucous membrane, when examined microscopically, only show overgrowth of the regular gland-tissue of the uterus, and not any malignant structures.

In course of time the case is distinguished from endometritis by the rapidity and extent of the growth, which may come to form great masses spreading down into the vagina and filling it.

The symptoms and course of the disease when advanced are practically

identical with those of cancer of the body of the uterus, from which it differs only in the histological characters.

The *treatment* is the same as that of cancer of the uterine body.

G. E. HERMAN.

UTERUS, POLYPUS OF.—The term “polypus” means a stalked growth. It has been applied to at least four different uterine products.

(1) *Fibroid Polypus*, a sub-mucous fibroid which has been expelled into the uterine cavity or beyond it, and has thus acquired a stalk.

(2) *Mucous Polypus*.—The simplest form of mucous polypus is that caused by an occluded cervical gland, which, being enlarged from retention of its secretion, first projects from the surface of the mucous membrane and then hangs down by a stalk. Such tumours have been called *Ovula Nabothi*. Sometimes several of these are aggregated together and form a larger tumour. Other mucous polypi are simply overgrowths of the mucous membrane, and consist chiefly of connective tissue. Polypi of these kinds seldom reach a size larger than a hazel nut. They only cause leucorrhœa, and perhaps hæmorrhage when touched. They are easily cured by seizing them with a pair of forceps and twisting them off. There is another kind of polypus, commonly classed under “mucous” polypi—viz., *follicular hypertrophy of the cervix*. This is formed of an overgrowth of all the cervical tissues, muscular tissue, vessels and glands, the overgrowth of the glands being the most conspicuous change. These have been called “channelled” polypi. They, and the polypi formed by blocked glands, are by some called “adenoma.” Such a polypus causes leucorrhœa, backache, and, it may be, slight hæmorrhage. The *treatment* is to twist it off, or, if the pedicle be thick, to remove it with an écraseur.

(3) *Placental Polypus*.—This is a retained portion of placenta with entangled clot, which still has some vascular connection with the uterus. For *treatment*, &c., see ABORTION.

(4) *Fibrinous Polypus*.—A clot retained in the uterine cavity and having some attachment to the uterine wall. *Treatment* as for placental polypus.

Cancer sometimes forms a polypoid tumour.

G. E. HERMAN.

UTERUS, SARCOMA OF.—Sarcomata of the uterus—i.e., tumours com-

posed of embryonic connective tissue—are rare. Before this name had been given to these growths they were described under the title of “recurrent fibroids.” They are usually of the rounded type, less often of the spindle-celled kind, sometimes of mixed types. They more often grow in the body of the uterus than in the cervix. They are met with in two forms—circumscribed and diffuse. When *circumscribed*, they form rounded tumours growing in the uterine wall, to the touch very much like uterine fibroids, but softer. Fibroids sometimes degenerate into sarcoma. At this stage they can be distinguished from fibroids only by microscopical examination. In the *diffuse* form, assumed when the growth begins in the mucous membrane, the interior of the uterus presents an irregular ulcerated surface with ragged fungous outgrowths, its walls being infiltrated with new growth. The circumscribed growths are often multiple; they may break down and ulcerate, and thus the transition can be traced between the circumscribed and the diffuse forms. The diffuse form can only be distinguished from cancer by the microscope. Late in the course of the disease secondary growths occur in other organs, although less often than in cancer.

The *symptoms* are much the same as in cancer—pain; hæmorrhage; watery, offensive discharge in the intervals of hæmorrhage; cachexia. Its course seems to be slower than that of cancer.

Nothing is known about the *etiology* of sarcoma. Unlike cancer of the cervix, its occurrence does not seem to be favoured by child-bearing.

The *treatment* is the same as that for cancer.

G. E. HERMAN.

UTERUS, SUB-INVOLUTION OF.—When, after delivery, the uterus does not return to the size it had before pregnancy, it is said to be in a condition of sub-involution. It is very common; so much so, that in anatomical works it is usually laid down that the uterus in women who have borne children is larger than in the virgin. The uterus does sometimes, after child-bearing, return to its former dimensions, so that the mere size of the organ affords no ground for giving an opinion as to whether there has been pregnancy or not.

Symptoms.—Sub-involution does not *per se* give rise to any symptoms, even though the uterus be of considerable size. But just as all damaged or degenerated

parts are more liable to inflammatory and other morbid changes than healthy parts, so a uterus which has not undergone perfect involution is more liable to become the subject of chronic metritis or endometritis and to menstrual irregularities than a well-involuted uterus. After the lying-in period has passed, the size of the uterus cannot be appreciably diminished by treatment. This effect has been claimed for many kinds of treatment, but the claim has never been supported by the evidence of cases so observed as to show that the observer was aware of the fallacies which make it difficult to draw conclusions on the point.

Etiology.—The main causes of sub-involution are the following:—(1) Deficient contraction of the uterus in the puerperal period; (2) Retention of placenta, membranes, or clot *in utero* during the early days of the puerperium. (3) Febrile conditions during the lying-in period.

Treatment.—Sub-involution is to be prevented by the use of antiseptics during labour and the lying-in: by proper management of the third stage of labour, so that the placenta and membranes may be completely separated and expelled; and, if uterine contractions be imperfect (indicated by after-pains, passage of clots and hæmorrhage), by the administration of ergot during the lying-in period.

G. E. HERMAN.

UTERUS, SUPER-INVOLUTION OR PUERPERAL ATROPHY OF.—This condition is produced when the puerperal involution of the uterus goes further than to restore it to the size that it had before delivery, the organ again becoming infantile in size, but it is rare. Nothing is known about its causation. It is not necessarily accompanied by any symptoms, except amenorrhœa, or, to use a more comprehensive term, premature menopause. The vaso-motor disturbances which often accompany the menopause, such as flushes, perspirations, headaches, &c., may be present with this condition. No serious impairment of health is produced by super-involution. There is no treatment which can restore the uterus to its former size. Intra-uterine stems, cauterization, galvanism, have been advised to stimulate, or rather irritate, the uterus. It is possible with them to make the uterus bleed, but this is not restoration of function, nor is it beneficial to the patient. Such treatment is moreover attended with

risk. Super-involution is of course attended with sterility.

G. E. HERMAN.

UVULA, DISEASES OF. — The uvula is the conical-shaped body depending from the centre of the free border of the soft palate. In its structure it resembles the soft palate, but it is especially rich in glands.

From its position the uvula naturally suffers when the soft palate and fauces are affected; hence it is liable to inflammatory conditions, and to be the seat of the local manifestations of measles, scarlet fever, diphtheria, syphilis, &c. Occasionally the uvula is the starting-point of the inflammation, and very rarely the mischief is confined to the uvula, the term *Uvulitis* being applied to this condition. In some cases the engorgement of the uvula may proceed to such a degree that it attains the size of the thumb, and causes an irritating cough, or even obstructs the passage of air.

Treatment. — When the uvula is acutely inflamed the application of a 20 per cent. solution of cocaine by the spray or laryngeal brush will often suffice to give relief, and pellets of ice in the mouth will assist. Should the swelling increase, scarification or amputation may be required.

Elongation of the Uvula. — By repeated inflammatory attacks, particularly in persons of lax fibre, the uvula may become permanently elongated. In one instance the uvula was so long that the patient could take it between his teeth; and, on removal, it was found to be 4 inches in length, its lower extremity being terminated with a knob. Elongation of the uvula generally gives rise to an irritating cough, especially when the patient is in the recumbent position; this fact should be borne in mind in investigating cases of nocturnal coughing. Schech states that an elongated uvula may cause spasm of the larynx, and quite recently A. Mantle (*Brit. Med. Journ.*, vol. i. 1890, p. 286) has described a case of laryngismus in a child cured by removal of the uvula. The elongated uvula may also give rise to the sensation of a foreign body in the throat or cause an inclination to vomit.

Treatment. — It is necessary, in the first place, to improve the general health. If there be constipation, a mixture containing the sulphates of iron and magnesium will usually diminish the relaxed condition of the uvula. Local astringents

may then be tried. A combination of the extract of krameria and cocaine, made up into a paste, is often very effectual. Or astringent gargles, such as alum or tannic acid, may be ordered. The application of nitrate of silver, fused on an aluminium probe, usually gives at all events temporary relief. Should these measures fail, the elongated organ must be amputated. This is best effected, after the application of a 20 per cent. solution of cocaine to the part, by means of Mackenzie's uvulotome. If this is not available, the extremity of the uvula may be seized with a pair of forceps, and part of the organ cut off with scissors. The indications for this operation as laid down by Semon are as follow:—“(1) Elongation to such a degree that the uvula, especially during sleep, is sucked into the larynx and produces attacks of suffocation. (2) The co-existence of a long, thick uvula, with a persistent feeling of irritation in the throat, and a constant tickling cough. It must be distinctly understood that this indication is only valid after careful examination of the pharynx, larynx and thorax, and after exclusion of all other possible causes. (3) The hindrance offered by a very long uvula to the performance of delicate endo-laryngeal operations. (4) Malignant disease starting from the uvula.” There can be no doubt that the uvula is frequently removed unnecessarily, as the reasons for its removal are but rarely met with. It should be borne in mind that the pain on swallowing which sometimes follows the operation is severe and persistent, and occasionally the hæmorrhage is excessive. In one or two cases the hæmorrhage, which was very trifling at the time of the operation, recurred with great violence some hours later. The most effectual way to arrest the hæmorrhage is to sip slowly a mixture of tannic and gallic acids, 360 grains of the former and 120 of the latter in an ounce of water as recommended by Mackenzie.

Abnormalities and Growths of the Uvula. — The uvula may be cleft, giving rise to a bifid uvula, or there may be two uvulas.

Apparent absence of the uvula is generally to be accounted for by destruction of this body through tertiary syphilitic ulceration.

Growths such as mucous polypus, papilloma, cavernous angioma, epithelioma, &c., occasionally take their origin from the uvula.

F. DE HAVILLAND HALL.

V

VACCINATION.—The inoculation of a human being with the contagium of vaccinia or cow-pox, with the object of protecting the person thus inoculated against small-pox—or, at least, against a severe or fatal attack of that disease.

The immediate effects of vaccination are chiefly local; they vary in character according as the person affected has, or has not, already been successfully vaccinated or undergone an attack or inoculation of small-pox.

Primary vaccination denotes the successful vaccination of a person previously unprotected as above; *secondary vaccination* is synonymous with *re-vaccination*.

I. PRIMARY VACCINATION.—(1) **Regular Course.**—When vaccine lymph of proper quality has been applied to the abraded skin of a previously unprotected person, or has been inoculated by a subcutaneous puncture, a couple of days pass without any observable result. In successful cases the order of subsequent events is as follows:—

End of second or beginning of third day, a small, hard, red *papule* appears at the site of inoculation; by the *fifth or sixth day,* the papule has become a distinct pearly *vesicle*, oval or circular in outline, with raised margin and depressed centre.

Eighth day, the vesicle is fully developed; it is plump and rounded, distended with clear lymph; its margin is firm and prominent, and the central depression very distinct. In the course of this day—sometimes by the evening of the seventh day—the vesicle begins to be surrounded by a circular rosy *areola* of inflammation.

Ninth and tenth days, both vesicle and areola continue to extend, with increased swelling and hardness of the subjacent subcutaneous tissue, which is generally somewhat painful. After the tenth day the areola begins to fade, and in another three or four days has usually quite disappeared, together with all swelling and hardness. With the fading of the areola the vesicle begins to dry in the centre, its contained lymph becomes opaque, contracts, and consolidates, so that by the

Fourteenth or fifteenth day the vesicle is converted into a hard brown scab, which gradually dries and blackens; and on about the

Twenty-first day—or, from the twentieth to the twenty-fifth day—the scab separates, leaving a *cicatrix*, which is circular, depressed, pitted, sometimes radiated, and generally permanent through after-life.

These events form a tri-weekly record, which may thus be summarized:—the *first week* is occupied by the formation and maturation of the *vesicle*; the *second week* witnesses the formation and decline of the *areola* and the drying of the vesicle into a *scab*; the end of the *third week* sees the separation of the scab with the discovery of the *cicatrix*.

The manner in which the lymph was inoculated—whether into one large abraded surface, or by several punctures, and these some distance apart, or set close together—will determine the development of one large vesicle, of several separate vesicles (one for each successful puncture or abrasion) or of one or more confluent vesicles, together with variations in the shape and extent of the resulting cicatrix or cicatrices.

The *constitutional symptoms* which attend these local phenomena are usually slight; they comprise slight rise of temperature, beginning about the fourth day, more marked during the areola stage, and often at that time attended with disorder of the bowels and stomach, but declining as the areola fades. At this period also, the axillary glands sometimes become greatly enlarged and painful, and occasionally—chiefly in hot weather—there develops in young children an eruption of *vaccine roseola* (chiefly confined to the limbs), or of the papules of *vaccine lichen*, or even of vesicles—which differ from true vaccine vesicles in possessing no central depression. These eruptions, when they do occur, generally disappear within a week.

(2) **Irregular Course.**—The order of events just related is in most cases followed very exactly. Sometimes, however, the development of the vesicle is either retarded by two or three days or slightly accelerated, but this variation from the normal course of events is not believed to impair the protective value of the result, provided that the phenomena be in all other respects regular and typical.

It is, however, important to recognize

a non-protecting and spurious form of vaccination distinguished by irregularity in the characters and course of the vesicle itself. Thus, papules, or even small vesicles, may appear early, and, beginning to decline about the fifth or sixth day, are marked only by a slight crust or scale by the end of the first week; or vesicles develop early after the inoculation, attended with much local itching (which is hardly ever noticed in a true vaccination), become conoid or acuminate, instead of flattened with a central cup-shaped depression, contain a straw-coloured opaque fluid in place of clear lymph, and soon develop an irregularly shaped areola, which rapidly fades after the sixth day.

(3) **Complicated Course.**—Friction or other injury and want of cleanliness may sometimes cause the vesicles to develop into ulcerating sores, more especially in strumous subjects.

Similarly, swollen axillary glands may suppurate, and erysipelas may supervene on vaccination. Such unfortunate accidents are rare in proportion as scrupulous care is taken in the selection and use of fresh lymph taken from a healthy vaccinifer, and strict attention paid to cleanliness as regards the instruments used and the place of vaccination, and provided that the healthiness and continued personal cleanliness of the person vaccinated be insured.

For a full account of three fatal cases of gangrenous ulceration of the arm after vaccination the reader is referred to the "Archives of Surgery" of Mr. Jonathan Hutchinson (vol. i. No. 2). In No. 3 of the same series reference will be found to a case of hæmorrhagic vaccinia (petechial eruption after vaccination) recorded by Dr. Gregory in *Med.-Chir. Trans.*, 1842, and to another of protracted ulceration of vaccination sores with keloid formation in the scars; also in vol. i. No. 2, an account of a case of vaccinia-prurigo.

II. SECONDARY VACCINATION (Re-vaccination).—Most persons can be re-vaccinated at least once during their lives; sometimes repeatedly, and at comparatively short intervals. Occasionally the resulting phenomena are exactly those of a regular primary vaccination, or differ only in the development of a smaller and more transient areola and the formation of a fainter cicatrix. More usually the result is only a *spurious vaccination* with the production of a small papule or acuminate vesicle, attended with great itching and

irritation, surrounded by an early and irregular areola which is at its height by the fifth or sixth day, and scabbing by the eighth day; but the general constitutional symptoms are often quite disproportionately severe. In some persons all attempts at re-vaccination are without effect.

PERFORMANCE OF VACCINATION.—Since it is undertaken as a protection against small-pox, which spares no age and is especially fatal to infants, vaccination should be performed as early in life as possible. If the child be healthy and well nourished, the age of from four to six weeks is appropriate; if the child be delicate, the operation may be postponed for another month or six weeks. If small-pox be epidemic in the immediate vicinity or have attacked other members of the household, the infant should be vaccinated at once, whatever its age and whatever its condition, acute and serious illness being the only exception to this rule. Under other and ordinary circumstances the existence of certain forms of ill-health or of disease in the child will render its vaccination inadvisable so long as this continues. Thus, a child suffering from any acute febrile disease, from diarrhœa, from disorders of dentition, from any cutaneous malady, and particularly from any form of herpes, eczema, or intertrigo (in view of which the scalp, and the skin-folds in the groins, the neck, and behind the ears should always be carefully examined)—one that has been lately exposed to the infection of measles or of scarlatina, or in whose neighbourhood erysipelas prevails at the time—should not be vaccinated so long as any one of these conditions persists.

The lymph employed for the purpose may be either "bovine" or "humanised;" in either case it must be taken from an animal which is both young (calf or infant), and in sound health and of healthy parentage, so as to avoid the possibility of transmitting other acquired disease as well. Since bovine lymph is apt to induce rather more severe local effects, humanized lymph should be preferred for the vaccination of delicate children.

The lymph should be used as fresh as possible; whenever practicable, it is best transferred directly from one subject to the other, as in "arm to arm vaccination;" but it may be stored for a reasonable time on clean flat "points" of ivory or bone, between glass plates, or in glass tubes of narrow bore, which are partly filled by capillary attraction with lymph

exuding from a punctured vesicle, and then sealed by melting first one end and then the other in the flame of a spirit lamp.

The lymph must be taken only from a perfectly formed, sound, uninjured vesicle, which has developed after the "regular" type and which has not yet developed any areola. Though lymph may exist in a regular vesicle as early as the fifth day, it is obtained more abundantly and more conveniently by the early part of the eighth day (*i.e.*, the day-week following the vaccination. Each vesicle is multi-cellular, and should be opened by delicately scratching or puncturing its surface, great caution being used not to draw blood, which must on no account be mixed with any lymph intended for vaccination. The lymph rapidly exudes from the punctures and collects on the surface of the vesicle, whence it may be collected for storage as above, or from which it may be taken on the point of a clean lancet or other instrument suitable for the performance of arm to arm vaccination.

The arm of the child that is to be vaccinated should be bared above the shoulders, and the skin of the deltoid region washed with warm water and rubbed dry with a clean cloth; this cleanses the skin, at the same time rendering it somewhat hyperæmic and more prone to absorption. The arm being then grasped so as to steady it and slightly stretch the skin, the lancet (charged with the fresh or stored lymph) is made to slightly puncture, scarify, or tattoo the skin over one or more surfaces, whose total or combined areas should equal about half a square inch. The procedure may be varied by first scratching the skin with a clean lancet and then rubbing lymph into the abraded surfaces. Where "points" are used, the dried lymph which they bear must be softened by holding them in the steam of hot water before inserting them into the punctures or firmly wiping them over the scarifications.

The lymph thus applied, together with any blood which may have appeared, should be allowed to dry before the child's clothing is re-adjusted. It is well to instruct the nurse not to wash the vaccinated spot for the first two or three days, and then to protect the surface by one or two loose folds of fine scorched linen. If, as the vesicles mature, local irritation become excessive, the frequent application of soft rags saturated with lead lotion affords much

relief, and a mild mercurial alternative may be given internally. All unguents and greasy applications should be interdicted, and the part must be kept clean and protected from friction.

The child should be seen again on the day week (eighth day) following the vaccination. If the development of the vesicle be then found to be retarded, it should be again inspected in another two or three days' time. Should the local condition still appear abnormal, the case must be carefully watched day by day to its termination. Only that vaccination in which the development and character of the vesicles conform to the normal type can be certified as successful and regarded as protective.

All instruments used for vaccination purposes should not only be kept scrupulously clean and bright, but should be thoroughly cleansed after each time of using, if employed for more than one vaccination at a time.

Re-vaccination is performed with the same precautions as regards the infancy of the vaccinator and the selection of the lymph employed. The resulting constitutional symptoms are apt to be more severe; and it is well to support the vaccinated arm in a sling, and to enjoin abstinence from its active use, so as to minimize the troublesome enlargement and irritation of the axillary glands. In the case of men and boys (in whom the position of the cicatrix is comparatively immaterial) it is useful to re-vaccinate on the inner and upper aspect of the left *forearm*; the vesicles are here less exposed to friction from the clothes, the movements of the shoulder are less hampered, and dressing and undressing become less painful.

Vaccination does not, in all cases, confer absolute immunity against small-pox; it does so, however, for the great majority of the successfully vaccinated; and such a person, if attacked with small-pox, suffers only the much milder "modified" form of the disease; while the probability of a fatal issue is even less than if the individual had undergone a prophylactic inoculation or a previous attack of small-pox itself. The necessity for re-vaccination depends upon the fact that in only a comparatively small number of persons does the effect of a successful primary vaccination in infancy persist throughout life; in other words most people become susceptible to vaccination (and, presumably, to the infection of small-pox) after the lapse of a period which differs in length in dif-

ferent cases. The immunity so commonly afforded by a successful primary vaccination seems to be more rapidly exhausted during the actively metabolic period of youth and adolescence; hence most individuals can be re-vaccinated successfully before the period of puberty, and very commonly at least once again—sometimes at comparatively frequent intervals—during adolescence or in later adult life. Certain diseases also—and enteric fever in particular—seem directly to impair or to neutralize the effects of vaccination. On the other hand, successful re-vaccination appears, equally with successful primary vaccination, to afford immunity against small-pox (or, at all events, against its more serious effects); and this, in each case, for a period which varies probably with the “physiological equation” of the individual operated on. Statistics show that small-pox is extremely rare, and a fatal result almost unknown, amongst adults who have undergone a successful re-vaccination.

Hence, if susceptibility to re-vaccination be coincident with susceptibility to small-pox (which appears a reasonable supposition); and if successful vaccination afford, in most cases and for some time at least, protection against small-pox (which the vast and increasing experience of all civilized communities affirms); then it is reasonable to urge the re-vaccination of all children at about the age of from 10 to 12 years, and to advise a second re-vaccination by the time that adolescence is completed, as well as after recovery from certain diseases, such as enteric fever in particular. Persons who are found to be thus again susceptible to the vaccine virus would do well to submit to another re-vaccination after a further lapse of years; and, in any case, to be re-vaccinated whenever they were likely to be exposed to the infection of small-pox, and during an epidemic of that malady.

C. E. SHELLY.

VACCINO-SYPHILIS (*Vaccination Syphilis*).—A term used to indicate the conditions—local and constitutional—which result from the introduction into the system of syphilitic infection along with the vaccine at the time of vaccination. It does not include that quite distinct class of cases in which the syphilitic poison has been subsequently inoculated on the site of abraded vaccine vesicles, nor those other cases in which symptoms of here-

ditary syphilis develop in the course of, or shortly after, vaccination; although an accurate distinction between these three groups may sometimes present very considerable difficulty. The syphilitic virus may be inoculated during vaccination by means of contaminated lymph, or by the contact of tainted instruments, with the freshly made punctures or scarifications.

In true Vaccino-Syphilis there is a double and contemporaneous inoculation of two distinct infections—the virus of vaccinia, and that of syphilis—but the incubation-period and the developmental phenomena of the latter overlap, without, as a rule, interfering with those of the former; so that in such cases the vaccination vesicles generally pursue their usual course and obtain their normal development (*see* VACCINATION), and it is not until after they have healed, and four or five weeks have elapsed since the date of the vaccination, that the local inflammation which constitutes a chancre begins. This is attended by the usual glandular enlargement (axillary bubo), and is followed, in due course, by the recognized secondary symptoms of constitutional infection. The occurrence of vaccino-syphilis—although, fortunately, an event of extreme rarity—is the most lamentable accident by which carelessness or misfortune can prejudice the performance of vaccination, and it is important by reason, first, of the care which is requisite for its prevention; and secondly, by reason of the necessity for discriminating between it and some other conditions which simulate it, and with which it is apt to be confounded (*see* VACCINATION).

Vaccination syphilis is to be avoided by the invariable and conscientious exercise of the following precautions:—Great care in the selection of a healthy vaccinifer; scrupulous cleanliness of all instruments, &c., used in obtaining lymph from the vaccinifer and in transferring it to the subject of the vaccination, together with effectual cleaning and drying of the instruments immediately after the performance of each separate operation; carefully avoiding to draw blood when opening vaccine vesicles for the purpose of obtaining lymph from them for vaccination, and the rejection of any lymph with which blood may have become mixed; and the refusal to take lymph for vaccination from any vesicles which are surrounded by an areola.

The various pathological conditions which are apt to be confounded with vaccino-syphilis, and from which it may have to be discriminated, include *Vaccinal Ulcers* (ulceration or gangrene at the site of the vaccination vesicles); and—if the concomitant symptoms suggest

evidence of general infection—*Vaccination Rashes* and *Hereditary Syphilis*. The principal points which differentiate these various groups are exhibited in the annexed tables, which have been compiled mainly from Professor Fournier's lectures on the subject.

<i>Vaccino-Syphilis.</i>	<i>Vaccination Ulcers.</i>
Chancre developed on the site of usually one or two only of the vaccination-punctures.	Ulceration affects all the punctures as a rule.
Inflammation is slight.	Inflammation and ulceration severe.
Loss of substance superficial only.	Ulcer deeply excavated.
Suppuration scanty or absent; scabs or crusts formed.	Much suppuration.
Border of chancre smooth, slightly elevated, gradually merging into floor.	Margin of ulcer irregular, as in "soft chancre."
Surface of floor smooth.	Floor of ulcer uneven, suppurating.
Induration "parchment-like" and specific, not merely inflammatory.	Induration inflammatory only.
Inflammatory areola very slight.	Areola inflammatory, and erysipelatous in character.
Gland swelling constant, indolent (syphilitic bubo).	Gland swelling often absent; if present, merely inflammatory.
Complications rare.	Complications—sloughing, erysipelas, &c.—often present.
Chancre never developed before the fifteenth day after vaccination; usually not until after three to five weeks; still in its earliest stage twenty days after vaccination.	Ulceration is present twelve or fifteen days after vaccination, and is fully developed by the twentieth day after vaccination.
<i>Secondary Syphilitic Eruption</i> due to true <i>Vaccino-Syphilis.</i>	<i>Vaccination Rashes</i> —(including roseola vaccinalis, miliaria vaccinalis, vaccina bullosa, vaccina hæmorrhagica); also accidental eruptions—rubeola, scarlatina, lichen, urticaria, &c.
Appears, at the earliest, nine or ten weeks after vaccination.	A true vaccinal rash appears between the ninth and fifteenth day after vaccination.
Requires, in every case, the pre-existence of a specific ulcer (chancre) at the site of vaccination.	Absence of inoculation chancre.
Exhibits the characters of a true specific eruption.	Eruption does not exhibit specific characters.
Fever often slight.	Fever always present.
Lasts for a long time.	Evanescence.
Usually accompanied by specific appearances on mucous membranes.	
<i>Vaccino-Syphilis.</i>	<i>Hereditary Syphilis</i> showing itself about the time of vaccination.
Begins with a local infection, chancre and indolent bubo.	No chancre; begins with general phenomena.
Typical development in four stages, viz.:—Incubation, chancre, second incubation, generalisation (secondary eruptions, &c.).	Has no typical development in connection with vaccination.
Never appears earlier than the ninth or tenth week after vaccination.	Time of development quite independent of vaccination.
	Is attended by the characteristic syphilitic bodily aspect.
	Other manifestations of hereditary syphilis may be present.
	The history may indicate syphilis.

In considering this subject it must be admitted that there are some few individuals and some constitutions in which the inoculation of vaccine virus—however pure the lymph—may evoke local and general phenomena strictly comparable with those erratic forms of blood-poisoning which occasionally appear as the sequelæ of other specific fevers:—compare—*e.g.*, the cancrum oris and noma of measles; hæmorrhagic and gangrenous varicella; the otitis of scarla-

tina; the necrotic periostitis of small-pox and enteric fever:—and, moreover, that all of these conditions may appear to be benefited by the exhibition of mercurials, although they have nothing to do with syphilis.

The *prognosis* of vaccination-syphilis is, with appropriate treatment, at least as good as that of severe cases of vaccinal (non-syphilitic) ulceration.

The *treatment* is essentially that of syphilis.

C. E. SHELLY.

VAGINA, DISEASES OF.—Malformations.—The vagina may be occluded by a transverse septum. Such septa are more common at its lower part, but may occur at any part. There may be more than a mere membranous septum. The vagina may be absent altogether, or be obliterated for part of its length.

The consequences and treatment of malformations of this kind are described in the article on AMENORRHOEA (*q.v.*).

The vagina may be *double*, a condition usually associated with duplicity of the uterus. This malformation gives rise *per se* to no inconvenience, and is usually discovered only when some other condition calls for local examination.

Unilateral Hemato- or Pyo-colpos.—One half of a double vagina may be imperforate, and in that case blood or pus may be retained in it. Such a distended half-vagina forms a tumour on one side of and partly in front of the pervious half. The tumour is elastic, and fixed, not displaceable; fluctuation may be obtained, although with difficulty.

The *diagnosis* will be finally made by puncture. Before opening such a tumour, and sometimes even after a free incision has been made, it is difficult to tell how far the fluid-containing cavity is formed by the vagina, and how far by the cervix uteri.

Treatment.—A piece of the septum should be cut out, so as to lay the two canals permanently into one.

Inflammation.—*Puerperal vaginitis* is the commonest form. Some degree of vaginitis during the involution of the uterus and vagina is very common, and this may last for months or years after, thus producing chronic leucorrhœa. If treated early, it is easily cured. The most acute form of vaginitis is *gonorrhœal* (see GONORRHOEA IN THE FEMALE). *Senile vaginitis* is not uncommon, especially in fat, constipated women with gouty tendencies, and in such is often associated with eczema or erythema of the labia.

Vaginitis may also be due to the irritation of pessaries, bits of sponge or wool left in the vagina, &c.; and it may also be due to irritating discharges from the uterus. *Granular or papular vaginitis* is a form met with along with pregnancy and gonorrhœa. Usually both these conditions are present, but there may be one without the other. This form is characterized by the presence in the vagina of hard papules, feeling like shot imbedded in the mucous membrane. The probability is that these papules are inflamed

and enlarged glands; but this has not yet been proved. Very rarely, instead of papules there are *pustules*. Only one case of this is known to the writer—viz., one which he himself observed and published. Another rare form has been observed in Germany, the *emphysematous*, in which there are vesicles containing gas. No such case has been observed in England, but one case of a similar condition affecting the cervix uteri has been published in this country. There is a form which may be described as *painful vaginitis*, in which the discharge is slight, but there is much heat and swelling of the mucous membrane. In this form pain and difficulty in sexual intercourse are prominent symptoms, and are described as varying in degree at different times. Another rare form is *dry vaginitis*, in which there is no discharge, but the mucous membrane is deep red and tender. The writer has observed two cases of vaginitis lasting for months, and peculiar in the profuse discharge of pus which was present, the quantity being in excess of that in gonorrhœa, but there being neither pain nor tenderness and the affection not disappearing after a course of a few weeks, as in gonorrhœa. Vaginitis is sometimes produced by the disease known as *lupus* of the vulva, or *esthiomène*. Lastly, just as by a chill nasal catarrh may be produced, so vaginal catarrh may own a similar origin.

In slight forms of vaginitis the only symptom is a mucous or purulent discharge. In severer forms there may be pain, and there may be also soreness or pruritus. Pain in micturition, from extension of the inflammation to the urethra, is frequent.

Treatment.—If rapid recovery be wished for, the patient should be kept in bed. The secretion should be washed away by a hot douche, as frequently as the patient can be got to use it, and after the douche a mild astringent lotion should be used. Mild astringents frequently repeated are more efficient than the occasional use of strong lotions. Tannic acid (gr. vj ad ʒj), or zinc sulphate (gr. ij ad ʒj) may be used. If there be pain or soreness, a saturated solution of borax or boric acid is best. In a chronic case in which treatment of this kind has been much used, some strong carbolic acid may be poured into a Fergusson's speculum, and then the vagina bathed with it. Care must be taken that it be mopped up before withdrawing the speculum, so that none may go in the

vulva. Laxatives should be given, and alcohol forbidden. If vaginitis be slight and of long duration, its inconveniences are so trivial, and the cure so difficult, that it is better to let it alone.

Cancer.—The vagina is very seldom the seat of primary cancer, although it is common for uterine cancer, as it extends, to involve the vagina. Primary cancer forms a warty growth on the mucous membrane.

Treatment.—If seen while it is yet movable, it should be excised, about $\frac{1}{4}$ inch of healthy mucous membrane round it being removed with it. After it has extended to the submucous tissue only palliative treatment is practicable.

Sarcoma of the vagina is rare. It may form rounded nodules, very much like fibroids, but softer, and unlike fibroids they have no connective tissue capsule. They can in their early stage only be distinguished from fibroids by microscopic examination. After they have begun to break down and ulcerate they clinically resemble cancer.

The only treatment is early removal when possible.

Fibroids of the vagina are rare. They seldom reach a great size. They commonly attract notice by the mechanical inconvenience which they cause, leading to a protrusion, or blocking of the canal. They are encapsuled, so that their removal is usually easy, and is the only treatment.

Prolapse of the anterior vaginal wall with the bladder is called *cystocele*; of the posterior wall with the rectum, *rectocele* (*q.v.*).

Cysts are sometimes seen in the vagina. They are rare, and their mode of origin is disputed. They only cause mechanical inconvenience by their presence if they reach some size. They are seldom larger than a hen's egg.

The treatment is to cut away as much of the cyst wall as possible.

G. E. HERMAN.

VAGINISMUS.—A nervous disease, which consists in hyperæsthesia of the mucous membrane of the vulva.

Symptoms.—In this affection the slightest contact with the mucous membrane provokes cries of pain, and uncontrollable movements having for their object to withdraw the part from contact; and this, although the patient is quite willing to be examined. The tenderness is not limited to one spot, and examination under anæsthesia fails to detect any disease of the vulva. Contact in some cases

provokes not only pain, but spasmodic contraction of the levator ani muscle and narrowing the vagina.

Certain *morbid conditions* of the vulva may cause symptoms like those of vaginismus. Urethral caruncle, fissures of the fourchette, follicular vulvitis, a peculiar disease in which very tender patches of a deep red or purple colour are seen on the mucous membrane of the nymphæ and around the meatus urinarius, lupus of the vulva, abscess in Bartholin's gland, painful vaginitis. These will be distinguished from vaginismus by ascertaining by physical examination the local cause of the trouble. These conditions—both vaginismus and the local conditions subsequently mentioned—although often discovered on marriage, may come on for the first time after years of married life, and after child-bearing.

Treatment.—Vaginismus is a nervous disease which cannot be cured. Even childbirth fails to remove it, but with time it may diminish in severity. It can, however, be greatly relieved, and, for the time, removed, by the local use of cocaine in the form of an ointment, applied to the vulva (gr. xx ad vaseline $\bar{3}$ j). Or as a pessary (cocaine hyd. gr. v, gelatin gr. xx, glycerin ad $\bar{3}$ ij). Cutting operations have been devised, but are quite useless.

G. E. HERMAN.

VENESECTION.—Abstraction of blood from the living body by incision of a superficial vein—a mode of general blood-letting or bleeding.

Although nowadays much less generally resorted to, venesection still deserves confidence as a remedial measure of extreme value in certain diseased conditions; for example—in the early stage of inflammation, such as acute pleuritis and pneumonia, occurring in the plethoric and robust, and when followed by remedies which maintain its immediately sedative effect on the circulation; in acute congestion of the lungs—as when this condition follows exposure during chronic bronchitis or emphysema; in some forms of cerebral congestion; in sunstroke; and in certain varieties of eclampsia; generally when there exists great venous congestion with over-distension and consequent enfeeblement of the right heart, as in poisoning by carbon dioxide; and, perhaps, in those cases where it is intended to abstract from the circulation a certain bulk of poisoned blood in order to substitute for this an equivalent of pure blood or of saline solution by intra-

venous injection. Small bleedings, repeated as required, are also practised to reduce excessive cardiac action and to relieve pain and dyspnoea in some cases of aneurysm, in particular thoracic. The chief general indications for venesection, as afforded by the condition of the circulation, are turgid veins, a small, tense pulse, and a labouring heart. It is not a measure suitable to childhood, old age, or in debilitated conditions of the system.

The operation may be performed, if necessary, upon any superficial vein—as on the dorsum of the foot or hand—but is most readily carried out on one of the veins at the bend of the elbow, preferably on the median cephalic; or, if this cannot be found, on the median basilic (which lies close over the brachial artery).

The patient being, as a rule, seated, a broad bandage is first fastened round the arm above the elbow, so tightly as to compress the superficial veins without stopping the arterial current in the limb. The vein selected is then steadied by the thumb and partly laid open by an oblique, transverse incision, care being taken to make the skin wound larger than that in the vein. The thumb is removed, and the escaping blood is caught and measured in a suitable vessel, none being allowed to fall on the dress or bedclothes of the patient. When a sufficient amount has been drawn, the operator places his thumb over the incision, removes the compressing fillet from above the elbow, and finally seals the wound with a small pledget of lint, which is retained in its place by a few turns of a narrow figure-of-eight bandage, the arm being then placed in a sling for a day or two.

If the jugular vein be opened, the incision should be made from above downwards and inwards, so as to cross the fibres of the platysma, but this form of the operation should be avoided in view of the risks of air entering the circulation, and of other serious complications.

The lancet or scalpel used must be sharp and perfectly clean. The limb should not be moved while the blood is flowing, lest the skin slide over the opening in the vein and thus induce hæmorrhage into the cellular tissue. Nervous patients, and those whose veins are small or ill-filled, should be made to grasp a book or walking-stick before and during the operation.

It is worth bearing in mind that in the case of acute inflammatory conditions of

the abdominal organs, a moderate bleeding from the arm is more effective than the abstraction of a much greater volume of blood from the veins of the abdominal wall, as by leeching; and that, similarly, acute prostatitis is better, more promptly, and more effectually treated by opening two or three veins in the wall of the rectum, by means of a narrow, sharp bistoury, and encouraging subsequent bleeding by tepid injections, than by the application of leeches to the anus.

C. E. SHELLY.

VERTIGO (Giddiness; Dizziness).—“A feeling of uncertainty of our position in space relative to surrounding objects . . . constantly associated with impaired equilibration” (Grainger Stewart).

The equilibrium of the body is believed to be controlled by a centre situated in the cerebellum, which is greatly under the influence of the impressions received by the senses of hearing and sight. The semicircular canals and labyrinth certainly play a most important part in maintaining the equilibrium of the body, and it is probable that the vertigo met with in dyspepsia is due to disturbance of their functions as the centres for the auditory and vagus nerves are in close proximity in the medulla. Vertigo is often associated with other disorders of sensation—*e.g.*, nausea, deafness, tinnitus aurium, dimness of sight, faintness, palpitations, hallucinations, and even loss of consciousness.

Symptoms.—An attack of vertigo may supervene quite suddenly whilst the patient is standing, sitting still, lying down, or walking; not infrequently it occurs during stooping, and it may be transient, persistent or recurrent. Some people complain of giddiness after looking fixedly at an object for some time, or when the eyes are closed. The patient either has a sense that objects are moving round him or that the objects are stationary whilst he is in motion; the direction of the movements being horizontal, vertical, lateral, rotatory, or there may be a sensation of sinking downwards, or the impressions are confused, and the patient feels as if impelled in several directions. The outward result is some degree of reeling, and, if no support be at hand, he may fall down.

Etiology.—The causes of vertigo are many and various. It may accompany almost any disease of the central nervous system, but is most constant in disease of the cerebellum or its peduncles, in which case it is direct and independent of any

ocular trouble; in disease of the pons, crura cerebri, corpora quadrigemina or cortex, it is also met with and may occur independently of any ocular lesion. Paralysis of one ocular muscle, notably the external rectus, is a frequent cause, and vertigo may also result from mere weakness of one of the muscles (muscular asthenopia), as when the eyes are over-tired in myopia. In disseminated sclerosis and locomotor ataxia it is often present and is due chiefly if not entirely to the strabismus. In epilepsy and migraine it is sometimes complained of, also in cases of exhaustion of the nervous system from over-study, mental anxiety, sexual excesses, or from too great indulgence in alcohol or tobacco. In miners' nystagmus vertigo is present, but not in the nystagmus which is congenital or comes on soon after birth, as the patient is then presumably accustomed to and disregards the contradictory impressions he receives. There are, however, other sources of visual giddiness besides strabismus and nystagmus; looking down from a great height causes it in a great many people, whilst some cannot be in a building with a lofty roof without feeling giddy, and in others a strong light will produce it (*see AGORAPHOBIA*). In certain forms of disease of the ear giddiness is the prominent symptom (*see MENIÈRE'S DISEASE*). Giddiness from waltzing is probably due to the disturbance produced in the semicircular canals by the rotation; giddiness from swinging is partly due to this cause and partly to the peculiar sensation caused by the body apparently descending faster than the viscera. In sea-sickness the impressions from the eye, the labyrinth and the muscular sense are all contradictory and combine to produce the vertigo. General anæmia and heart disease, especially aortic valvular disease, are amongst the causes. But in no inconsiderable proportion of cases, the stomach (and probably the liver also) is at fault, and *vertigo a stomacho leso* is a well-recognized condition. There may or may not be organic disease of the stomach, and the attacks vary much in severity; they may come on at any interval after a meal, and sometimes no connection can be traced between the ingestion of food and the onset of an attack, and indeed it may be induced by fasting.

As regards the *diagnosis* it is obvious that a great many of the causes above enumerated will be self-evident if present. The cases that remain would be due either to brain disease, to ear disease, or

to dyspepsia. It must be remembered that the last named is far the most likely cause, and that vomiting, even when persistent and accompanied by headache, is no proof of the existence of brain disease. The presence of tremor would be strongly suggestive of this, however, whilst optic neuritis would be almost conclusive of it. So, too, deafness does not by any means exclude the possibility of the symptoms being due to dyspepsia. Even when no signs of dyspepsia can be elicited the results of treatment will sometimes furnish proof that the stomach was after all the peccant organ.

Treatment.—Careful attention to diet and moderate exercise are the most important points, the bowels should from time to time be acted upon by aloes or an occasional dose of blue pill, and small doses of alkali with gentian, calumba or quassia administered, when the vertigo, if due to gastric disorder, will soon disappear. The treatment of the other forms will depend upon their causation.

JOHN ABERCROMBIE.

VICARIOUS MENSTRUATION

means that the menstrual flow does not take place from the uterus, but *vicariously*, hæmorrhage from some other part replacing that from the uterus. This may now be fairly described as an exploded superstition. No such thing has ever been accurately observed or described.

Cases recorded as examples of it fall into three groups:—(1) Cases in which the only evidence is a vague statement from a patient, unaccompanied by dates. Every case in which a patient making such a statement has been asked to keep a diary, has failed to show a coincidence between the supposed vicarious hæmorrhage and the menstrual period. (2) Cases in which patients lose blood from some diseased part—*e.g.*, lungs or stomach, and in consequence become anæmic and do not menstruate, and think the bleeding is the consequence of the amenorrhœa, instead of its cause. (3) Cases in which, as in purpura, the general vascular tension accompanying menstruation causes hæmorrhage from other parts beside the uterus; that is, menstruation is accompanied by hæmorrhage from other parts, not replaced by it.

Cases in which the menstrual flow is replaced by a flow from some other part do not exist.

G. E. HERMAN.

VOMITING (Emesis).—Forcible expulsion of the contents of the stomach through the œsophagus.

The act of vomiting is produced by the dilatation of the cardiac end of the stomach, immediately followed by a violent expiratory effort. The former is accomplished by the contraction of the longitudinal fibres of the stomach, which by the same means is drawn over towards the diaphragm. The pyloric orifice is at the same time contracted so that the food is expelled only from the cardiac end. In bilious vomiting the contents of the gall-bladder are driven into the duodenum, and find their way through the pylorus, which must be then imperfectly closed. The respiratory effort is performed by the contraction of the diaphragm and abdominal muscles, and is of itself powerless to cause vomiting, but produces only distressing retching when the cardiac end of the stomach is still unopened. On the other hand vomiting becomes impossible when the respiratory muscles are paralysed. Thus there are two necessary factors for the performance of vomiting—dilatation of the cardiac end of the stomach, and forcible contraction of the diaphragm and abdominal muscles. The co-ordinated action of these muscles is regulated by a centre, situated in the floor of the fourth ventricle, and closely related to the respiratory centre. Efferent impulses proceed by the vagi to the longitudinal muscular fibres of the stomach, the phrenics to the diaphragm, and by the intercostals to the abdominal muscles. The centre may be excited by afferent impulses from almost any part of the body, but especially by those originating in the abdominal viscera. It may also be stimulated in a quasi-reflex manner by certain emotional states, and directly by the action of such drugs as tartar emetic and apomorphine.

Most infants, and some adults, vomit with the greatest ease and on very slight provocation, but in others the act of vomiting is generally preceded by symptoms of nausea—*e.g.*, giddiness, pallor of the face and feelings of faintness, coldness of the extremities and a weak pulse. Ineffectual attempts to expel the food may then be made on the part of the respiratory muscles, and they add considerably to the patient's discomfort, which is, however, as a rule, immediately relieved by the occurrence of vomiting.

Clinical Indications.—The irritation of faucial and pharyngeal inflammations sometimes induces vomiting, especially in children, and all kinds of gastric disorder are occasionally attended with the same result. Vomiting frequently occurs in acute catarrhal conditions of the

stomach, and is then associated with a considerable degree of nausea. It generally follows immediately upon the ingestion of food in cases of cancer of the middle of the stomach, but after the space of three or four hours, when the disease is situated at the pylorus. In the latter case the ejected material is usually streaked with blood in different stages of decomposition. The pain caused by the presence of food in cases of gastric ulcer is often relieved by the occurrence of vomiting, which, as a rule, however, only takes place when the pain has reached a certain intensity. The vomit of dilatation of the stomach is characterized by its great abundance, consisting perhaps of three or four meals, and by the presence in it of the *torula cerevisiæ* and *sarcina ventriculi*. Vomiting sometimes happens from compression of the stomach, which may be the result of tight-lacing, the pressure of a tumour, or the frequent application of tools against the epigastrium in certain trades. All cases of strangulated hernia and intestinal obstruction are attended at one time or another with vomiting, which is the more severe and persistent as the disease is more acute. At first merely matters from the stomach are rejected, but very soon these are mixed with bile from the duodenum, and at last the contents of the intestines themselves are regurgitated, from as far down as the seat of obstruction, if this be in the jejunum or ileum. The vomit has then a distinctly faecal odour, and is called "stercoraceous." The occurrence of faecal vomiting was supposed to depend upon a reversal of the normal peristaltic wave, but Dr. Brinton has suggested that the usual peristaltic motion would in cases of obstruction naturally set up two currents within the intestine, an outer one downwards and an inner upwards, so that the feces would at length mix with the bile in the duodenum, and ultimately even with the food in the stomach.

Nausea and vomiting are some of the earliest symptoms of peritonitis, and are common in cases of hepatitis, biliary and renal colic. They are rarely absent in the course of Addison's disease. Combined with diarrhoea, vomiting is a common result of acute and chronic uræmia: or vomiting may alone be present, occurring at first perhaps only in the morning, but afterwards whenever food is taken. It is liable in these cases to prove very persistent and intractable. The ejected matters generally contain

some urea, which, when they are alkaline, is partially decomposed into carbonate of ammonia. The conjunction of these two symptoms, diarrhoea and vomiting, although common enough in infants, should in adults always raise the suspicion of irritant poisoning, when the presence of uræmia has been negatived. It is important to remember that the cough of early phthisis is sometimes attended with vomiting, which may also occur in cases of right-sided pleurisy. The latter has been ascribed to congestive changes in the liver secondary to the inflammation of the diaphragmatic pleura. Occurring in the early morning, vomiting is one of the commonest symptoms of pregnancy, but it occasionally happens in women without any very apparent reason. It is also one of the frequent symptoms of chronic alcoholism.

Vomiting often occurs in the course of certain fevers. It may be a premonitory symptom of scarlatina or variola, and may also occur in the course of typhus and the cold stage of ague. The well-known black vomit of yellow fever owes its colour to the presence of masses of decomposed blood corpuscles, but is only met with in the most severe cases. Choleraic vomiting is often sudden and coincident with or following upon the discharge of the rice-water evacuations, to which the ejected matters are very similar. Sudden pain, such as that resulting from a blow on the testicles, a severe sprain or dislocation, usually causes a feeling of faintness, sometimes followed by vomiting.

Cerebral Vomiting.—As a symptom of brain disease, vomiting is of the greatest importance. It occurs in cases of tumour, meningitis, abscess, increased intra-cranial pressure, at the onset of apoplexy and more especially when the cerebellum is the seat of the lesion. There are no associated symptoms of gastric derangement and usually no preceding sensations of nausea, though these are in rare cases severe. As a rule the food is rejected soon after it has been taken, and it is decidedly uncommon for cerebral vomiting to occur on an empty stomach. It is an early symptom of tumour and meningitis and combined with headache may anticipate by a considerable time the development of further symptoms. Paroxysms of vomiting (gastric crises) sometimes occur in the course of tabes dorsalis. They are generally accompanied with severe pain in the epigastrium and sometimes with nausea. The vomiting may be incessant,

lasting for an hour or two or for two or three days. Recurrences are usually frequent and at irregular intervals, but in the interim there are no gastric symptoms whatever. Vomiting is a frequent result of vertiginous sensations, whether they result from Menière's disease or an injudicious meal; and to the same cause the writer would ascribe the symptoms of sea-sickness. Paroxysms of migraine are sometimes relieved by the occurrence of vomiting, which frequently also follows attacks of convulsions in children. Cases of habitual vomiting, lasting for years, are sometimes met with, in which no efficient cause can be discovered. Food may inevitably be rejected a few minutes after it has been taken, and yet no decided emaciation may be apparent. Such a condition usually occurs in young women in whom there is some evidence of an hysterical tendency and menstrual irregularity. Vomiting frequently occurs during the administration of chloroform, especially when the stomach is full, but it may also take place afterwards, and sometimes proves extremely intractable and alarming.

Treatment.—Vomiting is a symptom rather than a substantive disease, and its treatment is therefore first directed towards relieving the causal affection. This generally consists of some gastric disorder, the vomiting is then amenable to treatment, and the end is attained by the exhibition of remedies which act locally upon the *prima via*. But it is possible to depress the excitability of the vomiting centre by means of such drugs as opium, morphine, bromide of potassium, chloral, and probably hydrocyanic acid and strychnine; most of these exercise also a sedative influence upon the stomach, and should consequently be given by the mouth, when possible. In cases, however, in which the stomach is so irritable as to reject everything swallowed recourse must be made to hypodermic injection and rectal medication. The diet will have to be carefully regulated and it will be often found in severe cases that milk will be tolerated, when administered frequently and in small doses of a tea- to a table-spoonful. Sometimes even this is rejected, and it becomes necessary to give the stomach a complete rest for two or three weeks by the employment of nutritive enemata. The sucking of ice often proves soothing to the patient, and milk and other nutritious fluids are best retained when cool. Counter-irritation or the application of

leeches over the epigastrium is sometimes of value. When the stomach becomes more tolerant, the internal administration of subnitrate of bismuth and bicarbonate of soda, combined perhaps with hydrochlorate of morphine or hydrocyanic acid, tends to diminish the irritability. The action of the bowels should in every case be attended to and carbonate of lime may be added to the bismuth mixture if the motions are loose, and magnesia if there is a tendency to constipation. When the vomiting is accompanied with much flatulence, foul breath and other evidence of putrefactive fermentation, antiseptics are indicated and best administered in the form of creosote or sulphocarbolate of soda. Pepsine, by reason of its digestive power, is a valuable adjunct in some cases and acids, alkalies or bitters are all serviceable at times. Minute doses of tinct. iodi. or ipecacuanha occasionally succeed where other means have failed; and cocaine would probably prove useful sometimes. The vomiting so frequently occurring in infants generally responds to a rectification of the diet, which is commonly at fault, and the administration of bismuth with soda. If the child is not at the breast, the milk should be boiled during the hot summer months and mixed with lime water. The gastro-enteritis of infants is generally attended with such irritability of the stomach that everything swallowed is rejected. These cases are extremely difficult to deal with, but should be treated on the general lines mentioned above; especially is it important to give milk in very small quantities, frequently repeated. The vomiting of organic cerebral disease is little amenable to treatment, but any stomachic trouble should be remedied, as it may tend to stimulate an over-excitable centre. Counter-irritation to the nape of the neck, or ice applied to the same region, sometimes relieves not only the vomiting but also the headache of cerebral tumour. Several modes of treatment will have to be tried in those protracted cases of vomiting occurring in hysterical women, but the shower bath, valerian, and other antispasmodics seem to afford the best means of success. The vomiting of peritonitis, strangulated hernia, intestinal obstruction, renal and hepatic colic must be treated with opium, but in these cases the treatment of the cause is of much more importance than that of a mere symptom. The vomiting of pregnancy usually occurs only in the early

morning and is of little importance, but occasionally it is so severe as to seriously endanger the life of the patient. In severe cases a careful vaginal examination is necessary and an endeavour should be made to rectify any flexion of the uterus that may happen to be present. The local application of nitrate of silver has been recommended when the cervix is inflamed and covered with granular erosions. Besides the ordinary medicinal methods of treatment, oxalate of cerium may be tried, and Chapman's spinal icebag is sometimes of decided value. Stimulants may be urgently called for and none is so good as iced champagne, which is also easily tolerated by the stomach. In certain very rare cases, the induction of abortion becomes necessary, and this expedient is generally followed by an almost immediate relief to the symptoms. Uræmic vomiting must be treated by means of diuretics and sudorifics. The treatment of vomiting dependent upon the action of irritant poisons will be found discussed in the article upon that subject. Vomiting arising from other causes demands no special line of treatment, and must be conducted on general principles.

WM. GAY.

VULVA, DISEASES OF.—**Vulvitis** is common in children from gonorrhœa and from diabetes (see LEUCORRHOEA).

Follicular Vulvitis consists in inflammation of the mucous follicles which are scattered over the vestibule around the urethra, and on the inner surface of the nymphæ. The symptoms are soreness and itching of the parts. On inspection, the inflamed follicles are seen as dark red spots the size of pins' heads, dotting the mucous membrane. It is not common. Nothing is known of its ætiology.

The treatment consists in cleanliness and sedative applications, such as ointments of lead (ung. plumbi subacet. co.), bismuth (3j ad 3j), calomel (P.B.). Under treatment, especially in young subjects, it gets well; but we do not yet know enough of its clinical history to assign any definite period as that within which improvement may be expected. Sometimes it is very obstinate. Alcohol should be forbidden, and laxatives prescribed.

Gangrene of the Vulva, that is, rapid sloughing of the external genitals, is rare, but sometimes occurs. The gangrene is usually symmetrical. It differs from noma, in that it is not a progressive

process preceded by induration. There is death of a portion of the skin and subcutaneous tissues, and this dead part is cast off. It is different also from the creeping molecular disintegration which takes place in phagedæna or hospital gangrene, or the terribly rapid spreading inflammation of gangrenous erysipelas. The causes of this rare event are quite unknown. It may, although it is not usual, appear inclined to spread, and if so, the slough should be separated, and the surface freely cauterized with nitric acid or the actual cautery.

The treatment otherwise consists in supporting the patient's strength, relieving pain, and applying poultices till the slough has separated; afterwards zinc ointment may be used.

Tender Red Patches are sometimes seen on the mucous membrane of the vulva. Their usual situation is just around the anterior half of the vaginal orifice. They vary in colour from a pale brick red to a deep purple. They are extremely tender, and are sometimes, especially in women past the climacteric, accompanied by some contraction of the vaginal orifice, or at least what appears to the patient to be such. The morbid change seems to be closely allied to urethral caruncle, and to the red patches, associated with pain on micturition, that are sometimes seen extending along the urethra. It is important on account of the pain and difficulty, amounting sometimes to impossibility, attending sexual intercourse: and is one of those conditions which are sometimes included under the term vaginismus. In young women it sometimes gets well without treatment. In women past the climacteric it is very obstinate. Nothing is known about its ætiology.

Treatment.—The best treatment is the application of iodoform to the spots.

Various skin diseases: lichen, eczema, erythema, acne, syphilides may affect the skin of the labia. They present no essential differences either as to character or treatment from similar changes in the skin of other parts.

Warts are common on the vulva. They do not occur in clean and chaste women, but they may occur without unchastity in those who are not careful as to cleanliness. From their condition of origin, they often are seen with gonorrhœa. Attempts to communicate them by inoculation have failed. Warts of this kind are acuminate, broadest at the base, pointed at the free surface. They produce discharge and itching of the

parts. If quite small, dusting the parts with a powder of equal parts of calomel and oxide of zinc will make them dry up. If a little larger they may be rubbed with nitrate of silver. If too large to be thus destroyed, they must be cut off with scissors, or if associated with pregnancy, or of such a size that cutting them is likely to cause grave hæmorrhage, the Paquelin cautery knife may be used.

Syphilitic Condylomata are flat, not acuminate, and the free surface often slightly overhangs the base. These should be dusted with calomel, and mercury given internally.

G. E. HERMAN.

VULVA, LUPUS OF (Esthiomène).—Two opinions are held as to the nature of this disease—one, that it is lupus vulgaris, modified by the local conditions of warmth, moisture and vascularity under which it develops. The other, that it is a form of tertiary syphilis. The latter view is supported by the facts that in many cases there is a history of syphilis, and that antisymphilitic treatment is admitted to be the most effective in this disease. Against it is urged, that often no history of syphilis can be obtained, and that with it there is seldom if ever found tertiary syphilitic disease of other parts, or of the bones and periosteum underlying the diseased tissues, and that it sometimes co-exists with lupus vulgaris. As there is this difference of opinion as to the pathology of the disease, it would be better if the French term *Esthiomène*, which implies no theory, were adopted. But "lupus," being more generally used, is employed here.

Symptoms.—The disease begins mostly during the years of menstrual life, between twenty and forty. It is a form of ulceration accompanied by the production of fibrous overgrowths of the surrounding and adjacent tissues. It is very chronic, and whilst in progress at one part it heals at another, producing hard, thick, cicatricial tissue. The presence of healing and the absence of wasting of the body, and, as a rule, of glandular enlargement, mark the essential difference from cancer. It attacks the labia, clitoris, hymen, vestibule, vagina, uterus, groins, perinaeum, anus, and adjacent inner side of the thighs. It progresses by imperceptible disintegration of tissue, not by sloughing. The tissues may be deeply excavated. Ulceration and hypertrophy are not invariably combined; slight degrees of one may

occur without the other, but when either morbid change is extensive, the other is found also. The hypertrophies are hard, fibrous overgrowths: and they may surround a canal so as to form strictures; stricture of the rectum, of the urethra, and of the vagina, may be thus produced. Of these the first is the most common, the last the least so. The disease also renders the mucous membrane adjacent to the disease, but not affected by it, liable to inflammation; and this inflammation, the character of which is marked by its persistence and tendency to recur, may precede the ulceration and the overgrowths. The disease may cause death by hæmorrhage from vessels opened by the ulceration, but this is quite rare. It may also cause death by perforation: thus, when affecting the

uterus it may eat through into the peritoneum; or vaginal lupus may perforate the bladder. These are also rare events. Stricture of the rectum, by the incidents secondary to it, may also cause death.

The *treatment* is to cut off the hypertrophic masses with Paquelin's cautery, and to apply black wash or iodoform to the ulcerations. This is usually followed by improvement: and in slight cases may lead to cure. But in cases of long standing, where the disease is extensive, cure is seldom attained; treatment ameliorates the condition, the advance towards recovery goes a certain distance and then comes to a standstill. This is partly because from the chronic nature of the disease patients do not persevere with treatment.

G. E. HERMAN.

W

WART (Verruca).—Warts are excrescences on the skin formed by circumscribed hypertrophy of its papillary layer covered by thickened epidermis. They vary in size from a pin's head to a large bean, and are always acquired, so-called congenital warts being, indeed, nævi. Warts are flat, rounded or pointed, sessile or pedunculated, coloured like the normal skin or deeply pigmented; they may be smooth on the surface or rough, or split up in a digitate, brush-like manner. They may be solitary, but are generally multiple and sometimes very numerous. They develop chiefly on the fingers and hands in children, on the scalp or about the genitals in adults. Occasionally they arise from the mucous membrane of the mouth or anus, and may extend a considerable distance up the rectum. There is some reason to believe that all forms are more or less contagious, venereal warts being conspicuously so, but individual susceptibility to wart development varies within very wide limits.

Various clinical types are recognized, of which *V. Vulgaris* is by far the commonest, the usual subjects being children, and the seat the hands. They are certainly predisposed to, and aggravated by, personal uncleanness. At first they consist of a small, smooth, hard lump in the skin, the surface of which is unbroken and semi-translucent; soon they become rounded, button-like prominences. As the papillæ continue to hypertrophy, the

cuticle ultimately yields, the surface of the wart becomes rough, irregular, villous and dark in colour, mainly owing to the closely adherent atmospheric impurities. Frequently warts of this class disappear with an altogether inexplicable suddenness, leaving perfectly normal skin. As a rule, they are more obstinate, tending to disappear spontaneously about puberty, but they do not by any means always do so.

V. Digitata is the commoner form in adults. The essential characters are the same as those of *V. vulgaris*, but they usually attack the scalp, especially of women, where they cause great annoyance, as they "catch" the comb, and, being very vascular, often bleed freely. They are usually numerous, soft and very ragged at the extremity.

V. Senilis, Plana vel Sebacea represents the type usually met with in old age, especially in persons of seborrhœic tendency and uncleanly habits. They are commonest over the scalp, back and chest, then on the arms and face, in which latter situation they may closely resemble freckles. They are flat and greasy, always pigmented, and often markedly so, their tint varying from a pale yellow to dark greenish-brown; they are easily detached with the finger-nail, leaving a slight superficial erosion. The papillary hypertrophy is not nearly so marked as in *V. vulgaris* and *V. digitata*. Senile warts, although they give rise to no subjective symptoms, may prove the

starting-point of malignant epitheliomatous growths.

V. Acuminata is the form usually found about the genitals. They develop with great rapidity, and, if uninterfered with, persist indefinitely. They are not syphilitic manifestations, although often associated with them, but result from gonorrhœal, leucorrhœal or other irritating discharges, which accumulate as the consequence of neglect of cleanly precautions. In the male they are generally on or under the prepuce; in the female they are commonest on the inner side of the labia, but usually spread to surrounding regions (clitoris, vagina, perinæum, anus). They are at first soft, bright red in colour, long and pointed; they may be present in very great numbers and attain immense dimensions, becoming cauliflower-like excrescences, which secrete a copious, thin, very offensive, acrid, highly infective, muco-purulent fluid.

Treatment.—Warts in children often disappear rapidly when sulphate of magnesia is given in doses sufficiently large to cause three or four copious motions daily. If the treatment does not prove efficacious in the course of a few days, it may be discontinued, as being useless. Salicylic acid is the most useful local application, and, dissolved in collodion or alcohol (3ss-3j ad 3j), applied night and morning, is generally successful for common, senile and digitate warts. In obstinate cases the acid nitrate of mercury, caustic potash, or glacial acetic acid may be applied with caution. Very pointed warts may be destroyed by electrolysis, which obviates the risk of bleeding, or by the galvanocautery. Warts about the genitals are best treated by rigid cleanliness, constant washing with disinfectant lotions of carbolic acid, alum, or tannin, followed by dusting powders of borax, salicylic acid, talc or calomel. When very large they should be snipped off, the base being cauterized so as to prevent all danger of bleeding.

J. J. PRINGLE.

WHOOPIING COUGH (Pertussis).

—A contagious disease due to the presence of a specific poison, which is probably contained in the mucus discharges from the respiratory tract.

Symptoms.—The period of incubation is usually rather prolonged, lasting about two weeks, but in some instances it has seemed much shorter than this.

The disease may be divided into two stages: The catarrhal or prodromal stage, in which it may be difficult to recognize

anything specific or different from a mere "feverish cold," and a paroxysmal stage.

The Catarrhal or Prodromal Stage.

—The first period is usually of about seven to ten days' duration, but may be much longer, and sometimes lasts only a day or two.

The chief phenomena observed are:—languor or irritability, seldom drowsiness, a temperature not usually rising above 101°, a dry hacking, clanging, or aphonic cough, with a little thickness of the voice. These symptoms are usually worse towards night-time, and even thus early the cough may be more frequent and more spasmodic than the cough of a simple catarrh, and also more liable to be most troublesome in the night-time, waking the patient, especially in the early hours of the morning. The physical signs are simply those of catarrh of the respiratory tract: râles and rhonchi. At the end of a week in well-marked cases the face presents some puffiness, especially about the eyelids, but the urine is very seldom albuminous, and the facial fulness is doubtless the effect of simple congestion from the suffocative character of the cough. At this period also ulcers, of which the base is often covered with a white exudation, may sometimes be seen on or near the frænum, though usually they only appear after the establishment of the paroxysmal stage. These ulcers are of very frequent occurrence, but their correspondence with any projecting tooth and the time of their appearance go to prove that their association with the disease is accidental—not ætiological.

Sometimes the cough is the only sign of the catarrh, but in other cases there may be running from the nose and sneezing. In a typical case the fever subsides in about a week, but not so the cough, which becomes more explosive and more liable to run together into paroxysms, the daily number of which may be very numerous in severe cases.

Paroxysmal Stage.—As these fits of coughing become more pronounced, the mental distress accompanying them increases. The long-drawn inspiration, which always succeeds and occasionally precedes the series of spasmodic expiratory efforts which make up the paroxysm of coughing, becomes audible as the "whooping" or "crowing" sound, from which the disease takes its name. During the early part of the paroxysmal stage, the total duration of which may be four or more weeks, hæmorrhages may

arise from the nose and mouth, from the ears, and, more commonly, into the subconjunctival tissues. A peculiarity of the paroxysm is the ejection of a large quantity of pearly-looking mucus at the end of the fit of coughing; this is expectorated as far as the pharynx, but the quantity is sometimes so large, that even infants, without vomiting, eject the discharge on to the floor. Vomiting is more prone to occur from a whooping paroxysm than from any other species of acute cough. Facts go to prove, not only that hæmorrhages may occur as the result of the paroxysms of coughing, but also that widespread or intense explosions of nervous energy may take place. Convulsions of serious import—squinting, loss of sight, the passage of water and fæces, curious chilly sensations, and sensations of tingling—may attend or follow the fits. The rapid development of a drowsy state is almost as much to be feared as the convulsions. Besides coma and convulsions, sudden collapse may occur, in which the pulse and heart may resemble that found in the algide stage of cholera, but this is rare. That some of these symptoms are due to hæmorrhages into the nervous tissues cannot be doubted, the occurrence of hemiplegia and monoplegia has been recorded. The mental state after the convulsions is variable, even in the same case; instead of listlessness there may rarely be unwonted gaiety, recalling that occasionally noted after true epilepsy.

The face may become much swollen and have a slight mulberry tint; the conjunctivæ may be dingy and suffused, and cutaneous petechiæ may be noted. A whoop by no means always follows each paroxysm, and sometimes only a few whoops may occur throughout the long course of an undoubted case. All children who "whoop" are not suffering from pertussis, as some nervous subjects whoop on the least occasion, as on waking from sleep, in beginning to cry, or during crying. If the lung mischief be marked—*e.g.*, broncho-pneumonia—the whoop may be in abeyance. The precise set of conditions on which whooping depends is not always present, probably a certain force of inspiration and a certain degree of openness of the laryngeal aperture are necessary for its production.

Hæmoptysis is frequent; hæmorrhage from the bowels and emaciation are among the other symptoms in severe cases. Sometimes there is marked wasting from an early period and

independently of the occurrence of vomiting.

Other complications chiefly concern the lungs and pleura. Broncho-pneumonia and pleurisy are very common; pericarditis and laryngitis occur rarely.

The broncho-pneumonia is generally of the disseminated variety, and post-mortem examinations show that it probably originates in collapse. The consolidation has a tendency to persist and pass into fibrotic and caseous conditions, but even after lasting some weeks it may pass away.

Whooping cough often leaves behind it a tendency to the development of the peculiar paroxysmal and whooping character in a subsequent cough, even if due to an ordinary catarrh. It appears certain that this is not a genuine relapse. This habit of body is most easily established in members of neurotic families. Probably, long after the pertussis has subsided the whooping paroxysm may remain as a non-contagious habit.

Diagnosis.—In the first days this may not be possible, as influenza, measles and other catarrhal affections may present identical symptoms; occasionally it appears as though the pertussis were engrafted on an ordinary cold. Mediastinal tumours, including cheesy bronchial glands and pent-up empyemata, may produce a paroxysmal cough indistinguishable from that of whooping cough.

Prognosis depends on so many factors that each case must be considered on its merits. All are agreed that infants only a few months old are bad subjects for the disease. Convulsions and stupor are of grave omen; broncho-pneumonia adds to the seriousness of the case and so does rickets. In very severe cases the voice, whoop and cough may be almost suppressed, as in laryngeal diphtheria, and these signs are of exceedingly grave significance, being often followed by death from asphyxial convulsions. The season of the year exercises considerable influence, the winter being the most unfavourable period, then the spring; but this is chiefly noted in the children of the poor, and arises from the accompanying defective hygiene—vitiating atmosphere and want of warmth.

Pathology and Morbid Anatomy.—In fatal cases collapse and broncho-pneumonia are commonly present. In the latter event the parts about the root of the lung and the middle lobe of the right lung will generally be found to be most severely affected. There may be col-

lapse of the greater part of a lobe or the lesion may occur in scattered patches; emphysema being present elsewhere. Subcutaneous and mediastinal emphysema are also observed in some cases. Besides atelectasis of the lungs, bronchiectasis sometimes occurs, and these two conditions are sometimes associated. The glands about the trachea and roots of the lungs may enlarge and become cheesy and tubercular, the latter affection being a not uncommon sequel of pertussis. Sometimes, though less frequently than after measles, the mucosa of the intestines suffers from catarrh, the abdominal glands swell and tabes mesenterica may result.

Ætiology.—The exact cause of the disease still remains to be discovered, as although fungi and bacteria have been found in the sputa none have yet been proved to be pathogenic. The disease is especially common during the first four years of life, and is much less frequent after the seventh year, but it may occur at any period, the aged not being completely exempt. Female children are much more often attacked than male. A second attack is rare. Although, as a rule, the virus does not travel far, it may probably be conveyed by the clothes of persons not themselves suffering from the disease, although this is doubted by some observers and is certainly of rare occurrence. A child should not mix with others until at least six weeks from the commencement of the whooping, and not then unless the paroxysmal cough has ceased.

Treatment.—Cases presenting a noticeable degree of bronchitis must be kept in bed in a warm room (temp. 60° F.), ventilated without draughts. The treatment of the catarrhal stage is simply that of an ordinary catarrh, modified by the degree of lung complication, which, however, is seldom severe during the prodromal stage. The fresh air in autumn, or at any other season, is better than close confinement, if the child is strong and there are no pulmonary complications. Woollen clothing next the skin is most desirable. During the simple catarrhal stage the chest should be rubbed—front and back and under the arms—with turpentine liniment, night and morning, and a mixture containing carbonate of ammonia and ipecacuanha with some nitrate of potash may be given three or four times a day. A steam spray of carbolie acid appears to be useful in diminishing the frequency of the cough. On the theory that the disease is due to an

organism which first settles on the nasal mucous membrane, various germicide preparations have been used to that part and to the naso-pharynx. A 1 per cent. solution of resorcin may be applied by means of a brush to all parts of the nose and throat every two hours during the day, and even at night if possible, for the first ten days of the case. After this period it would be useless; and other antiseptics should be tried. Finely powdered boric acid, sulphate of quinine, powdered benzoin, salicylic acid and iodoform may be used separately or combined in equal parts, diluted if necessary with fine starch powder; a few grains being used every two or three hours as an insufflation.

During the paroxysmal stage, or after it has passed its first period, there can be but little use in persevering with germicide medicaments. What remains is the nervous element of the disease. Belladonna, prussic acid and bromides are the best nerve restorers or sedatives; small doses should be first prescribed and the dose gradually increased; each remedy should be tried separately; but sometimes the following combination is most successful:—℞ Tinct. belladonna ℥x, potassii cyanidi gr. ʒi, ammonii bromidi gr. ii, spt. amm. arom. ℥v, syr. simpl. ℥xv. aq. ad ʒij; t.d.s.; for a child three years old.

Mopping the pharynx and adjacent parts of the larynx with a 10 per cent. solution of hydrochlorate of cocain, care being used not to overcharge the brush, is sometimes useful. And the fumes from nitre paper and those produced by burning the compound lobelia powder or Himrod's powder appear to diminish the tendency to the paroxysmal attacks. A blister to the back of the neck may be sometimes applied with good effect. Arsenic and change of air are also valuable measures during convalescence.

ANGEL MONEY.

WRITER'S CRAMP (Scrivener's Palsy).—Writer's cramp is the most important member of a large class of diseases called "occupation neuroses." These most usually affect people whose employment consists in the frequent performance of highly specialized coordinated movements, which become impossible on account of the supervention of spasm whenever they are attempted. All other delicate movements may be executed with impunity, but in the later stages of these affections they too may become implicated, especially if

the required muscular combination form part of that primarily affected. The most frequent symptom is spasm, and hence the particular neurosis is generally expressed by affixing the word cramp to the occupation which has given rise to the disease—*e.g.*, “telegraphist’s cramp,” “violinist’s and piano-player’s cramp,” and “writer’s cramp.” There are many others, but the last mentioned is by far the most important member of the group, and will be taken as a type of the family. Several varieties of the affection are met with, in one of which spasm is the most marked feature, and in another pain, which may be referred to the muscles, bones, joints, or to the nerves themselves. Both these symptoms, however, are often present in the same case. Sometimes there is a weakness of some muscle or group of muscles underlying the affection, which at other times is simulated by some organic disease, such as progressive muscular atrophy.

Symptoms.—These are, as a rule, gradually developed. It is perhaps noticed that an unusual feeling of fatigue is experienced in writing, and that a certain amount of effort is necessary to form the letters, which were before formed almost unconsciously. The index finger is apt to slip off the penholder, which is held more tightly than it used to be, and the hand may lie flat upon the paper instead of being held, as normally, three-quarters prone. The fingers feel clumsy, and, with the increasing effort to guide the pen properly, a great amount of unnecessary strength is expended. Spasm of the flexors or extensors soon ensues and, gradually extends, so that after writing a few words the pen makes a splutter and falls from the grasp. Various devices are indulged in to overcome the difficulty. The chief movements may be relegated to the forearm, upper arm and shoulder, and, as they also become involved, to the trunk muscles. The penholder may be grasped between the index and middle, middle and ring fingers, or with the closed fist. The patient is driven from one resource to another, and at length all fail, and he may not be able to form even a single letter. Some, with infinite labour, teach the left hand to write, but that also is often overtaken with the spasm. In some cases it is not so, and the rest thus afforded results in complete recovery of the right hand. In the early stage delicate movements, other than those of writing, may be performed with ease, but with the spread of spasm they also become involved. The muscles

may not be decreased in size, but frequently they are distinctly flabby and the grasp is weak. It is often found that some of them respond less readily to the faradic current than those of the healthy arm, and sometimes too readily to the galvanic. The spasm is usually tonic in character, and comes on during the act of writing or the performance of some movement in which the grouping of muscles is somewhat similar. Spontaneous spasm, not only of the muscles engaged in writing, but of the shoulder and head, has been described in advanced cases. Tremor is sometimes a prominent symptom, and may itself cause the difficulty in writing or be associated with tonic spasm. In some cases the inability to write depends almost entirely upon a feeling of muscular fatigue; in others, upon actual pain, which may be referred to the course of the nerve, where tender points may sometimes be found. The pain, which is distinctly neuralgic in type, may at length come on independently of the act of writing, and in some cases tends to spread. Feelings of “numbness” and “pins-and-needles” are sometimes experienced, and anæsthesia was present in some cases described by Solly. The general health is sometimes good, but very often the patient is neurotic, irritable, and may become so despondent as to attempt suicide.

Diagnosis.—Since the act of writing is one of the most complicated man is called upon to perform, requiring a nice adjustment of nearly all the muscles of the arm, it is one of the first to be disturbed by any incipient disease specially affecting the upper extremity. Hence it is necessary to eliminate disseminated sclerosis, progressive muscular atrophy, neuritis, and even a gradually developing hemiplegia, before making a positive diagnosis in the early course of the disease. In the later stages the condition is quite unmistakable. Another difficulty arises from the fact that people are sometimes conscious of a feeling of fatigue and other sensations after prolonged writing, and, having heard, or probably read, of the affection, fear that it is about to develop. In such cases there is never any spasm, and a few days’ rest relieves the symptoms.

Prognosis.—This is favourable under two conditions—that the disease is treated in an early stage, and that a prolonged rest is possible. Unfortunately, neither condition is fulfilled in most cases, for men whose livelihood depends entirely upon their power of

writing are particularly affected. They refuse, therefore, to give in until absolutely compelled to do so, and hasten back to work as soon as the symptoms are sufficiently alleviated to permit it. Although the prognosis in such cases is extremely bad, recovery sometimes ensues under the most disadvantageous circumstances.

Pathology.—This must be a matter of speculation, for no anatomical changes have yet been discovered. Many observers believe that the starting-point of the affection is a lesion of some muscle or group of muscles, or of the peripheral nerve terminations in them. The act of writing demands a most delicate adjustment of the muscles, especially of the hand and forearm, and the failure of a single muscle, therefore, to respond to the appropriate stimulus causes a want of harmony in the movements, whilst the over-action of the antagonists results in spasm. The exponents of this view point out that there is never any evidence of central change, and assert that, as compared with the healthy side, there is always a diminution of faradic excitability in some one or other of the intrinsic muscles of the hand engaged in grasping the pen, and that, as these are placed *hors de combat*, their functions are performed by others in the forearm, which in their turn fail and are replaced by upper arm, shoulder, and trunk muscles, which also at length succumb to chronic fatigue. Other observers have been unable to subscribe to this theory, because they find that spasm is in many cases the initial symptom, and often at last involves the very muscles which have ultimately become weak. According to their theory, the disease is of central origin, and arises in the following manner:—The education of centres (which may be widely separated from each other) for the performance of any delicate movement is mainly accomplished by lessening the lines of resistance between them, so that the movement, which was at first produced by a considerable mental effort, is at last executed almost unconsciously. If, therefore, through prolonged excitation, this lessened resistance be carried too far, there is an increased and irregular discharge of nerve energy, which gives rise to spasm and disordered movement. According to this view, the muscular weakness is explained by an impairment of nutrition accompanying that of function, and the diminished faradic excitability by the nutritional disturbance

descending the motor nerves. This seems by far the more plausible theory, and is now perhaps most generally accepted.

Ætiology.—There is often a neurotic predisposition, and the disease itself is sometimes inherited, as is illustrated by an instance recorded by Dr. Poore, in which three generations in a direct line were affected. Many patients also have a highly strung nervous temperament, and the onset of the disease can often be traced to some great anxiety or worry. Those are particularly affected whose occupations require prolonged and frequently repeated efforts at writing. Dr. Gowers considers that writing a "cramped hand" is one of the most frequent causes, and accounts for the frequency of the disease among lawyers' clerks. The extremes of life are little liable to writer's cramp, which is most common between the age of twenty and fifty. Males are much more frequently affected than females.

Treatment.—Of all suggested methods of treatment, rest is by far the most important. This does not mean that all movements of the arm must be prohibited, but only those which tend to induce the spasm. Dr. Gowers strongly recommends that patients should be encouraged to cultivate a "running hand," and asserts that, if this were universally adopted, writers' cramp would become almost unknown. Quill nibs or pencils must also be employed instead of hard steel pens. The various devices invented by the patient should not be countenanced, for, although they certainly put off the evil day, they conduce to the spread of the spasm. The left arm may be educated to write, and, for those whose position allows it, a type-writer is of great service, for it affords rest to the affected group of muscles and at the same time enables the patient to write. Internally, nerve tonics, such as strychnine, are useful when a condition of nervousness and irritability seems to underlie the affection, and bromide of potassium is indicated in cases of great restlessness and insomnia. The neuralgic type should be treated with sedatives, both locally and internally, and counter-irritants may be applied over the painful points in the course of the nerves. The application of the galvanic current, short of that which causes muscular contraction, combined with rhythmical movements of the affected muscles, has proved of the greatest service in the hands of Dr. Poore. Massage has also been recom-

mended, and forms the principal feature in a highly successful mode of treatment practised by a non-professional man in

London whose method has been approved by leading physicians in Germany.

WM. GAY.

X

XANTHOMA (*Xanthelasma*; *Vitiligoidea*).—A rare chronic disease of the skin characterized by the presence of flat plates or raised tubercles of a yellowish colour, and due to the development of a new fibro-cellular and fatty growth in the corium.

Two principal clinical varieties are usually recognized, but, as they frequently co-exist, and as there is no essential difference in their pathological characters, they are here described separately merely in accordance with custom.

X. Planum is much the commoner form. Its usual site is the eyelids, beginning in the great majority upon the left side, on the upper lid, and near the inner canthus. From this point it extends outwards along the upper eyelid, downwards to the inner side of the lower lid, then outwards along it, so that in an exaggerated case the eye is surrounded by a ring of disease. The mischief pursues a similar course on the right side, the condition being after a time always bilateral and symmetrical. The initial patches vary in size from a pin's head to a finger nail; they are imbedded in the skin, which is scarcely, if at all, raised by them, and retains its normal suppleness and softness. Their colour varies from a pale lemon-yellow to a deep buff or bright orange, and they have been aptly likened to chamois leather let into the skin. Sometimes the colour of the lesions is so faint that it is necessary to empty them of their blood by stretching before the yellow tinge can be verified. Their margin is well defined and either regular or serrated. No subjective symptoms are produced by the condition, unless it be so extensive as to cause some *gêne* in the movements of the eyelids. Patches have very rarely been observed upon the concha of the ear, the neck, chest, and prepuce. The plane variety is generally found in women of middle or advanced age, especially in those of dark complexion; it is very frequently associated with megrim, various neuralgiæ, menstrual disorders, or "any conditions capable of producing dark areolæ round the eyes" (Hutchinson).

X. Tuberosum vel Multiplex is a rarer condition, more extensive in distribution, and more serious in character than *X. palpebrarum*. It may occur independently, but usually develops in persons suffering from the former variety. Often the extension of the malady is first evidenced by the appearance on the face of plane lesions in regions other than the eyelids, especially round the nostrils, mouth or external auditory meatus. A few sparse and slightly elevated lesions may be present over the trunk, but the most numerous and most characteristically tubercular appear upon the extremities, especially upon their extensor surfaces, and on parts exposed to pressure. The seats of election are the tips of the elbows and knees, the shoulders, the buttocks, the backs of the fingers and toes, the palms and soles. In the two latter situations, as well as round the anus, where the natural lines are deep, the tubercles are arranged along, and exaggerate them. The symmetry of the eruption is generally remarkable. The lesions usually vary in size from a hemp-seed to a pea; they are deeply set in the skin, and project prominently from it; the epidermis over them is smooth and unbroken; they are a little hard to the touch. Sometimes they coalesce to form veritable tumours as large as a hen's egg or small apple. When the case is a severe one, flat xanthoma patches often develop on the mucous membrane of lips, palate, gums, tongue, or fauces, on the œsophagus, stomach, bile ducts, or intestine, on the trachea and bronchi, on the conjunctiva or cornea, on the peritoneum or pleura, or even on the endothelium of the heart and arteries. The development of the disease is usually slow, and the lesions once formed persist permanently without undergoing retrogressive changes. They do not as a rule cause subjective symptoms, but occasionally some pain is evoked by pressure.

X. Multiplex, like *X. planum*, is commoner in women than in men, especially about middle life; sometimes, however, it occurs in early childhood, and it is frequently hereditary, affecting several

members of the same family. The most interesting point in its ætiology is its association with jaundice, which has been noted in at least four-fifths of the published cases, although the exact relationship between the two conditions has not been definitely made out; and mere surmises on the point would here be out of place. In the majority of cases the jaundice precedes the xanthoma by a considerable time—generally by a year or more—but is still present on its development. In a not inconsiderable proportion of cases, however, jaundice has disappeared before the xanthoma lesions appear, while in others a persistent condition of yellow skin—*xanthochromia*—resembling, but not identical with, jaundice is present. The definite hepatic diseases which have been observed in this association are in order of relative frequency, chronic catarrhal obstruction of the biliary ducts, hypertrophic cirrhosis, gall stones, atrophic cirrhosis, and carcinoma; while gout, lithiasis, dyspepsia and similar conditions attributable, perhaps, to functional derangements of the liver are common concomitants. The disease is usually benign, but the internal lesions, especially of the heart and arteries, may occasionally prove fatal.

The *pathological anatomy* of the two varieties differs merely in degree. In both the epidermis and upper layer of the derma is healthy, while the middle and lower layers of the latter are involved by a new growth of connective tissue, the amount of which is small in the flat variety and great in the tuberous. In the meshes of the fibres are numerous multinuclear epithelioid cells, containing much fat, along with crystals of tyrosin and cholesterin, as well as granular pigment which is not confined to the cells.

Treatment is seldom resorted to, as the disease is, in the majority of cases, absolutely benign, but occasionally it is desirable to take away patches from the eyelids, either to remove disfigurement, or to restore impaired movement. Excision is the most suitable procedure, great care being taken that no ectropion results. Painful outgrowths about the elbows have been removed by painting with a 10 per-cent. solution of corrosive sublimate in collodion; and Kaposi states that the troublesome condition of the palms and soles may be greatly benefited by vigorous rubbing with soft soap and by wearing india-rubber gloves and socks.

The disease described as **Xanthoma Diabeticorum** occupies a position as yet unsettled, but its closest affinities are certainly with the foregoing. It differs in the following respects: (1) it is always associated with diabetes mellitus; (2) it develops rapidly and sometimes intermittently; (3) it afterwards diminishes, or even entirely disappears without leaving any trace of its existence; (4) the lesions are denser and firmer than those of true xanthoma; (5) there is sometimes a bright congestive zone round their base, and at the apex they present a yellowish point like pus, but in reality are solid; (6) the tubercles are not generally bright yellow, while some are quite colourless; (7) they are abundant on the elbows and knees, common on the scalp and face, but never exist on the eyelids; (8) there is never jaundice present; (9) itching and tingling are always troublesome symptoms, and sometimes there is great tenderness; (10) although there is fibro-cellular infiltration of the corium, somewhat like that of xanthoma, it is more obviously in connection with the blood-vessels and sweat and sebaceous glands, and the fat and cholesterin characteristic of true xanthoma are absent.

While admitting that the condition presents some analogies to an inflammatory one, the designation of *lichen diabeticorum* suggested by some recent writers seemed peculiarly unhappy, as the disease presents no resemblance or relationship to the strictly demarcated and limited group of lichens.

Treatment must be directed towards the accompanying diabetes, and is often successful in removing or diminishing the growth.

J. J. PRINGLE.

XERODERMA.—A name still unfortunately employed in this country to designate the mildest form of ichthyosis, to which reference may be made. It bears no relation to the disease first described by Kaposi, which is discussed in the following article.

XERODERMA PIGMENTOSUM (*Atrophoderma vel Angioma Atrophicum; Melanosis Lenticularis Progressiva; Kaposi's Disease*).—A very rare condition of the skin, of which only between forty and fifty cases are on record. It usually affects more than one member of a family, or the various members of one sex in the same family, and generally begins in summer.

Symptoms.—In most cases the first

signs observed are minute, measly, erythematous blotches upon parts exposed to the sun (face, neck, arms, legs). These soon disappear, leaving pigment spots like ordinary freckles, but attention is often attracted to these by their depth of colour, close aggregation, and especially by their persistence during winter. The intermediate skin becomes dry, scaly, cracked or slightly eczematous, and capillary dilatations (telangiectases) rapidly form, and heighten the colour of the skin. Gradually the pigment disappears in places, the skin undergoing a spontaneous atrophy, which results in the formation of non-pigmented, glistening scar-tissue. This change usually begins and is most marked on the face, especially about the nose and cheeks, and the ectropion thereby produced is characteristic, materially adding to the disfigurement. Possibly the tears have infective properties; at all events, those parts of the face over which they run, owing to the ectropion, or are wiped by the patient's mopping, undergo most rapid shrinkage, and form the favourite seats for the first development of the malignant, epitheliomatous growths which mark the commencement of the last stage of the disease. These begin

as brownish, warty growths, which even from the first present the microscopic characters of epithelioma. They increase with varying rapidity to form growths of any size, and invade all tissues encountered in their onward march. Ultimately they soften, discharge and fungate.

The disease begins in the first or second years of life, and is often apparently attributable to undue exposure to the sun; it is progressive despite all treatment, and generally causes death from marasmus about puberty; but a considerable proportion of cases have succumbed within a few years, or, on the other hand, have lived to middle age.

Treatment.—Careful attention to the maintenance of cleanliness contributes to the comfort of the patient, and probably the use of white precipitate ointment, to the face especially, retards the advance of the atrophic, cicatricial and ulcerative lesions there. The epithelial growths should be excised or scooped out as soon as they appear, and the wounds thus caused heal kindly. Even large growths may be removed with advantage. Internal remedies exert no influence upon the disease.

J. J. PRINGLE.

Y

YAWNING.—Yawning is a co-ordinated act of considerable complexity, consisting fundamentally of three parts—(1) A prolonged and deep inspiration, accompanied with elevation of the soft palate and uvula, depression of the lower jaw, opening of the mouth, it may be to the fullest extent, and slight retraction of the head; (2) a brief tonic spasm of the muscles concerned in these movements; and (3) a prolonged expiration sometimes combined with a vocal sound. The depressed jaw and open mouth are not essential factors in the act, as those will have discovered, who, in the exigencies of social life, have endeavoured to suppress their yawns. There are several occasional associations, *e.g.*, a click may be heard in the ears, a shiver felt down the back, or, indeed, all over the body, or there may be an almost irresistible impulse to stretch the limbs.

Yawning generally indicates a condition of fatigue and a necessity for rest. It is thus most common at night, but

when sleep is deficient either in quality or quantity, it may actually be most frequent immediately after getting up. It results as readily from mental as from physical fatigue, and is a well-known expression of ennui. One of the strangest characters of yawning is its infectiousness, which is sometimes very striking. As an indication of anxiety it may not infrequently be noticed, and it is then only one of many other evidences of the influence exercised by various emotions upon the respiratory centres. Yawning is one of the earliest of the premonitory symptoms of fainting, and may often be observed in the operating theatre at the commencement of the session. It is very common as a symptom of sea-sickness, and frequently occurs in cases of dyspepsia after the ingestion of food. In a few cases of tetanus persistent yawning has been one of the earliest features of the disease. It is an old observation that the act of yawning is accompanied with extension of the fingers in certain cases of hemiplegia in which

there is absolute paralysis and a strong flexor contracture. No altogether conclusive explanation of the nature of yawning has yet been put forward. Poore has suggested that it is practically a reflex spasm of the depressors of the lower jaw, induced by fatigue of the elevators—a spasm commencing in the region of the fifth nerve and spreading thence into the other territories involved. Such a view is clearly only applicable to yawning as a result of fatigue. The theory enunciated by Hughlings Jackson in regard to the functions of the cerebellum affords a ready explanation of the nature of yawning. He believes, briefly, that the motor functions of the cerebellum are complementary to those of the cerebrum, in such a way that the former represents movements in the order from the general, or most automatic, to the special, or most voluntary, and the latter in the inverse order. Generally speaking then, the peripheral groups of muscles are chiefly subserved by the cerebrum, the central muscular groups by the cerebellum, and the extensors are far more under the influence of the cerebellum than are the more highly specialised flexors. The movements of the lower jaw are looked upon as examples of those belonging to the general rather than to the special type, and are therefore represented in the cerebellum. The extension of the head, the gape, the deep inspiration, and the stretching of the limbs, which is essentially a movement of extension, may all, according to this view, be regarded as of cerebellar origin, and the whole series of events be explained by “a wave of cerebellar influence.”

It must be rare, indeed, that yawning has to be treated *per se*. When too easily induced, however, it may be considered that the recuperative power of the individual is below par; an inquiry should then be made into the method and habits of life of the individual and any irregularity corrected. There is frequently some gastric derangement, which has to be treated on general lines and appropriate tonics may afterwards be prescribed.

WM. GAY.

YELLOW FEVER.—An acute disease, accompanied by jaundice and hæmorrhages, occurring only in certain sub-tropical regions, and due to the action of a specific poison of a nature at present undetermined.

Symptoms.—The incubation period is

stated to vary between one and fourteen days; it is probably usually from one to four days. The onset is sudden, with a sense of chilliness, the temperature rising rapidly to 103° F., or even 105° F.; headache, sacral and lumbar neuralgic pains are frequently complained of, and delirium is not uncommon. Sometimes there is spontaneous vomiting. The bowels are usually sluggish; the urine tends to become scanty or is suppressed, and is often albuminous and contains casts. In the mildest cases the fever may attain its maximum in twelve hours, and recovery may commence at once; in others the maximum temperature may not be attained until the third or fourth day. The pulse is compressible, and not, as a rule, very frequent; perspiration is often a marked feature. After the paroxysm, in all but the mildest cases, a tendency to hæmorrhage is developed, either from the nose, mouth, vagina, kidneys or stomach. About the third day, but it may be the fourth or fifth, the skin and conjunctivæ become of a yellow tint, which will vary in depth according to the severity of the attack, the skin sometimes assuming a deep-olive or mahogany hue. The fæces are not usually clay-coloured. The previous state of health exerts much influence on the course of the disease. The mortality is always rather high, but varies in different epidemics, the percentage of fatal cases being sometimes as low as fifteen, and in other epidemics as high as seventy-five. Fatigue, anxiety, grief, &c., diminish the patient's chances of recovery.

Prognosis.—The gravity of the case will be directly proportionate to the degree of hæmorrhage.

Post-mortem Appearances.—The body is deeply jaundiced, the heart pale and soft, the pleuræ ecchymosed, the lungs may contain infarcts, there may be congestion of the lining membrane of the alimentary canal throughout with hæmorrhagic erosions of the mucous membrane of the stomach, the liver is of a *café-au-lait* colour, and the hepatic cells under the microscope show granular disintegration; the kidneys are enlarged.

Ætiology.—The disease is certainly due to a specific poison, but the organism peculiar to it has not yet been isolated. It is believed by some writers to be allied to the malarial poison which is now known to be due to a micro-organism. It is met with only in epidemics in certain sub-tropical countries, and especially on the West Coast of Africa, America and

the West Indies. The disease is transmissible by the air for a short distance, but may be arrested by a high wall or a running stream; it is transportable by fomites to any distance, and is often borne by vessels from one port to another. Some writers, however, do not admit the contagious nature of the disease. Very few Europeans who are exposed to it escape infection, but the Negroes are much less liable to be attacked. One attack protects against subsequent seizures.

Treatment.—An emetic and a purge of castor oil may be given at the outset. Perspiration should be encouraged by warm drinks and clothing. There is no specific remedy, but quinine may be

given, and, if there be hæmorrhage, perchloride of iron. Until the paroxysm is over, nothing but effervescing drinks should be allowed, and, after that, only milk and barley-water. No solid food should be allowed for at least ten days after an attack, and even then caution is necessary, as fatal relapses have often been induced by indiscretion in the matter of food at a more remote period than this. Where there is much vomiting, ice may be given and the patient be fed by nutrient enemata. The patient must be kept absolutely quiet, and the bedroom be well ventilated. Stimulants, such as iced soda and brandy or iced champagne, may be given freely.

JOHN ABERCROMBIE.

Z

ZINC, Poisoning by.—There are only two salts of zinc of any importance—the sulphate, which is much used as an emetic and is a mild irritant poison, and the chloride. The latter is an irritant and corrosive poison, producing burning and pain in the mouth, throat and epigastrium; vomiting and purging, the vomit and stools sometimes containing blood; cramps, collapse and coma. Perforation of the stomach has been known to occur. In cases that do not prove immediately fatal, the patient may die at a later period from stricture of the œsophagus.

Post-mortem Appearances.—The mucous membrane of the mouth and œsophagus is white and tough, whilst that of the stomach and intestines shows more or less congestion or inflammation.

Treatment.—Vomiting should be encouraged by the administration of warm water, milk and albuminous fluids. The stomach-pump must not be used; carbonate of soda in large quantities is the proper antidote. Milk and eggs may be given freely with tepid water; astringents and morphine are also useful.

ZYMOTIC (from ζυμω, *I ferment*; "zymosis" and the verb from which it is derived occur in Hippocrates).—A word introduced into general use by Dr. William Farr to include the epidemic, endemic, and contagious diseases, and to express their "property of communicating their action, and affecting analogous transformations in other bodies." He included in this class of diseases "all

the principal diseases which have prevailed as epidemics or endemics, and all those which are communicable either by human contact or by animals in a state of disease, as well as the diseases that result from the scarcity and deterioration of the necessary kinds of food or from parasitic animals."

Dr. Farr divided the class of zymotic diseases into four groups or orders—(1) **Miasmatic**, diffusible through air or water and attended by fever; the matter by which they are communicable is derived from the human body (small-pox), or the earth (ague). (2) **Ænthetic**, which may be properly called contagious, as they are communicated by contact, puncture, or inoculation (syphilis, glanders). (3) **Dietetic**, which arise when the blood is supplied with improper food (scurvy, ergotism). (4) **Parasitic**, which may infest the skin, the intestinal canal, or all the tissues of the body.

This classification was, however, to a large extent non-natural, and has passed out of use, the term zymotic disease being now limited in the returns of the Registrar-General to Dr. Farr's first two groups. The diseases now placed under the head of zymotic diseases, and their classification are as follows:—*Miasmatic Diseases*—Small-pox, chicken-pox, measles, epidemic rose rash, scarlet fever, typhus, relapsing fever, influenza, whooping-cough, mumps, diphtheria, cerebrospinal fever, simple and ill-defined fever, enteric fever. *Diarrhæal Diseases*—Cholera, diarrhœa, dysentery. *Malarial*

Diseases—Remittent fever, ague. *Zoögenous Diseases*—Hydrophobia, glanders, splenic fever, cow-pox, and other effects of vaccination. *Veneral Diseases*—Syphilis, gonorrhœa, stricture of urethra. *Septic Diseases*—Phagedæna, erysipelas, pyæmia, septicæmia, puerperal fever.

The term "zymotic diseases" is also taken by the Registrar-General to be an equivalent for the term "specific febrile diseases," and it is in this sense that it is generally understood.

The analogy between fermentation and the infective process was noted by Hippocrates, and the discovery that certain fermentations (as the butyric) and certain diseases (as splenic fever) are due to the growth of bacteria has tended to

increase the force of the analogy. Certain pathogenic microbes (*e.g.*, the bacilli of anthrax and of diphtheria) produce, when grown outside the body, a decomposition of albumen, resulting in the formation of poisonous bodies (alkaloids, and poisonous albumoses). That this action of the bacilli is of the nature of ferment action is generally recognized, and it would therefore appear that in certain febrile diseases the symptoms are due to a form of toxæmia, the toxic bodies being the results of the growth of an organized ferment in the tissues or fluids of the body; in this limited sense then the analogy between the specific febrile process and fermentation holds good.


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
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